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# SOIL CONSERVATION

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CONSERVATION SERVICE  
UNITED STATES DEPARTMENT OF  
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VOLUME XXV



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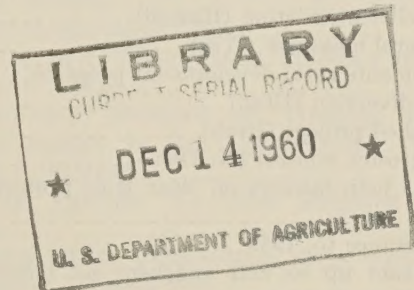


# SOIL CONSERVATION

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# SOIL CONSERVATION



(Commemorative Stamp to be released August 26, 1959. See pg. 3)

**AUGUST 1959**

# SOIL CONSERVATION

Soil Conservation Service • U. S. Department of Agriculture



# SOIL CONSERVATION.

**EZRA TAFT BENSON**  
SECRETARY OF AGRICULTURE

**DONALD A. WILLIAMS**  
ADMINISTRATOR, SOIL CONSERVATION SERVICE

OFFICIAL ORGAN OF THE SOIL CONSERVATION SERVICE  
U. S. DEPARTMENT OF AGRICULTURE, WASHINGTON, D. C.

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TOM DALE, Editor

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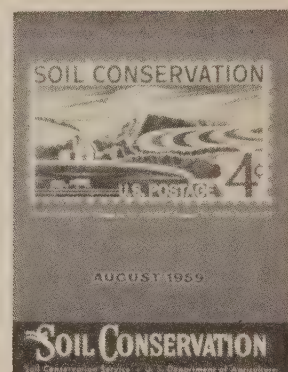
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**FRONT COVER.**—A black and white photograph of the new 4-cent soil conservation commemorative postage stamp is shown on the cover. The stamp will be formally released at the annual meeting of the Soil Conservation Society of America at Rapid City, S. Dak., on August 26, 1959. It will go on sale the following day at post offices throughout the country. The stamp will be printed in three colors, yellow, green, and blue.

Issuance of the stamp is a tribute to farmers and ranchers who have put to use such soil and water conservation measures as those shown in the stamp design—terracing, stripcropping, pasture improvement, pond construction, and tree planting.

It is a tribute to the Nation's soil conservation districts. It is a salute to the State and Federal scientists and technicians who have carried on research, developed better ways of protecting the land, and helped landowners carry out conservation plans. It is an expression of gratitude to other conservation programs, such as education, credit, and cost-sharing, which have helped farmers and ranchers install conservation improvements more rapidly.

The silhouette of a city in the background is a reminder that care of the land, our primary source of food, shelter, clothing, and wildlife, is important to urban as well as rural people.

All orders go to the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

# The Soil Conservation Postage Stamp

MANY commemorative postage stamps are issued to observe the anniversary of a noteworthy historic event or to honor a long-dead national hero. The world's first soil conservation stamp, to be released on August 26, 1959, at Rapid City, S. Dak., celebrates no anniversary and honors no man.

Its issuance is, rather, a recognition that American farmers and ranchers, and their government, are hard at work to protect and improve our most valuable natural resource, the soil.

The Post Office Department issues about 12 commemorative postage stamps each year. That is about as many as the Bureau of Engraving and Printing can print satisfactorily; it is about as many as the Department's distribution system around the country can absorb; and it is about as many as most philatelists believe should be printed.

Requests for commemorative stamps originate with individuals and organizations from all parts of the Nation and are made by letters sent directly to the Postmaster General. No legislative action is necessary. (The Department has a backlog of requests for commemorative stamps of approximately 3,000 and receives from 250 to 300 new requests each year.)

The stamps suggested must meet the criteria established for the selection of United States commemorative postage stamps, and are then referred to the Citizens' Stamp Advisory Committee.

The Committee is made up of three of the most outstanding philatelic authorities; three nationally known artists and designers; and a representative of the United States Information Agency with three ex officio members.

After careful review of requests, the Citizens' Stamp Advisory Committee recommends a commemorative stamp program. When the program is approved by the Postmaster General, the artist members of the Committee are responsible for the designs of the selected commemorative stamps.

These designs are subject to the approval of the entire Citizens' Stamp Advisory Committee before recommendation to the Postmaster General, who makes the final determination.

The completed artwork is then turned over to the Bureau of Engraving and Printing for preparation of the model and color proof, which is submitted to the Post Office Department for the Postmaster General's approval. The dies are then engraved and the stamps are printed and distributed.

For each commemorative postage stamp, a site is chosen for the First-day sale dedication ceremony. On that day the stamp is available only in the designated city. The next working day, the stamp is on sale in the 36,000 post offices in the United States.

The Philatelic Sales Agency of the Post Office Department in Washington sells over \$2 million worth of stamps each year, and local post offices sell stamps to the approximately 20 million stamp collectors in this country. Estimates made by the Department indicate that total philatelic sales amount to between \$20 and \$25 million a year. These stamps, sold to collectors, are not used for postage and the Government is not called upon to perform any service, so that the sale of stamps for philatelic purposes is a profitable operation for the Post Office Department.

Observances are planned for the soil conservation stamp in most of the Nation's 2,840 soil conservation districts in cooperation with various agricultural, industrial, civic, and conservation groups.

First-day "covers" containing the stamp are available through the Postmaster at Rapid City, S. Dak. Upon request and receipt of addressed envelopes and a remittance to cover the cost of the stamps, the post office at Rapid City will place the new stamp on the envelopes, cancel them with a special cancellation mark used only on that day and at that place, and mail the envelopes on the first day of issue.



# Rural Development Begins With The Soil

By GLADWIN E. YOUNG

**S**OIL and water conservation is proving to be an essential tool in helping underdeveloped agricultural areas of the country to a better balanced economy and a better living for low-income rural families cooperating in the Rural Development Program.

Proper use of land, and the water that nourishes it, is the real base upon which rests the economy of approximately 200 county areas in which this local-State-Federal rural improvement undertaking is moving ahead. That is true whether the soil has been pretty well "farmed out" through years of use or neglect or was not too productive to begin with.

Starting with this premise, local leaders, with cooperation of State and U. S. Department of Agriculture research, extension, technical, and cost-sharing and credit agencies, have literally built the Rural Development Pro-

gram from the ground up. This special assistance is provided through regular programs of the Department, with coordination and leadership of state and county committees, and cooperation of other Federal agencies.

One of the first steps in a rural development area, after economic and related studies confirm its need for the kind of self-help support provided through this program, is that of providing soil survey information. The soil maps comprise an inventory of the land resources that is all-important in appraising the agricultural potentialities both of individual farms and communities in relation to the industrial or other off-farm opportunities.

Where generalized soil maps already have been made of rural development counties, the Soil Conservation Service makes them available to the local committees. These maps set out the basic soil resources of the county in such a way as to suggest the potentials for communities, watersheds, or other subdivisions in the counties. The maps may also be used in zoning or other planning. The Service helps in interpreting the general soil maps to indicate the problems and most likely opportunities for existing and proposed agricultural undertakings.

The Service similarly provides basic information from soil surveys already made on individual farms, and makes new surveys, within the limits of available facilities for doing so. The resulting soil and land capability maps show the lands that are best suited—or least suited—for row and grain crops, pasture and hay, woodland or wildlife use.

The basic objective in making a farm soil map for the Rural Development Program is to appraise the farmer's opportunities on the farm as compared with what they might be in some other occupation. This evaluation, in turn, is keyed in with the general goal of developing

Note:—The author is Deputy Administrator, Soil Conservation Service, Washington, D. C.



Floyd F. Taylor (left), a cooperator in the Monroe County, Ohio, Rural Development Program, discusses the soil map of his farm with SCS soil scientist.



the county's or trade area's full potential for agriculture and for supplemental industries. The aim is for overall economic improvement by the people within the area, without the need for them to seek such opportunities outside the community.

Some of the developments stemming from the use of county or trade-area soil maps have included: The initiation of small-watershed protection and flood-prevention projects, roadside erosion control, designation of land areas best suited for wildlife and recreational purposes, selection of sites for local industries, and overall determination of lands best suited for various purposes in countywide or trade-area planning.

Soil mapping and conservation farm planning both have been speeded up in most rural development areas. In some cases, progressive soil surveys are made in advance in parts of counties where a substantial number of farmers come within the special category served by the Rural Development Program. These soil maps are used in the conventional manner for farm and ranch planning, with necessary supplemental interpretations on costs and benefits of special crops and practices needed in adjustments.

Similarly with conservation farm planning, the end rural development objective of bringing about maximum use of soil and water resources on a sustained basis is given specific attention by SCS technicians. They also help the farmers apply needed land-use and water-management conservation measures.

For the fiscal year 1959, 67 counties were allocated special funds for SCS assistance. These allocations were on the basis of an estimated 100 man-years of special technical aid in certain rural development counties in 30 States and Puerto Rico. The year before, about 71 man-years of such special technical aid was provided by the SCS.

A review of the latest available (1958 fiscal year) county rural development reports shows how the soil surveys and the conservation farm planning and technical aid consistently are contributing to overall advancement of the program.

Take, for example, Perry County, Ind., where the program is no longer considered a strictly "pilot" program, because it already had spread to nearby Crawford and Harrison Counties in 1958. The Soil Conservation Service provided 1½ man-years of soil survey and conservation farm planning help in Perry County. Soil maps



An abandoned farm that was bought by Franz Carpenter as an addition to his farm as part of the Rural Development Program in Monroe County, Ohio.





Roadside sign of Reedyville community, Butler County, Ky.

were furnished on 6,000 acres, and conservation surveys on 8,000 acres were converted to standard surveys.

Conservation measures were applied on 48 farms, with 24 basic conservation plans established on such farms; and 23 Rural Development Program farmers became cooperators with the Perry County Soil Conservation District. Also, local community interest in a



Soil conservationist discusses a conservation plan with Carl Gayer of Troy, Ind., who is a cooperator in the Rural Development Program.

watershed protection and flood prevention project on the 67,000-acre Middlefork Creek watershed resulted in its approval for planning early in 1959.

Illinois' rural development area in Alexander and Pulaski Counties provides a concrete illustration of the practical results of combining basic land-use planning with other available improvement facilities. Forty basic conservation farm plans, on approximately 2,750 acres, and about 25,775 acres for which land capability maps had been completed were reported for this two-county area.

The Farmers Home Administration refinanced one farmer, for example, by advancing him capital to buy 40 acres of adjoining land to make his farm an economical unit; to build a pole barn; to apply needed basic land treatment as shown by the soils information; and to improve his herd of beef cattle. Local banks also were considering expanding their financial assistance to low-income farm families.

The broader watershed approach to land and water problems in rural development areas is being given increased attention—as it is throughout the country. Thus, in Tippah County, Miss., the County Rural Development Committee was active in development of the Muddy Creek and the West Hatchie watershed projects. A reduction of about 90 percent in flood damages will result from the planned conservation land treatment and floodwater retarding dams and stream channel improvement. A full-time SCS technician was assigned to Tippah County, one of four rural development counties in Mississippi.

In Alabama's Chilton County, additional technical help was made available to 62 rural development cooperators during the year, with 35 new basic conservation farm plans developed and another half-dozen plans revised; and, soil mapping was stepped up on small, part-time farms. In Fayette County, the Langston-Dodson Creek watershed plan in the area is about completed.

And in South Carolina, SCS technicians in Bamberg County have concentrated their efforts on helping farmers develop conservation farm plans on *all* small farms in that rural development area since the program's start there in the fall of 1956. They reported 66 such plans on small farms.



In Berkeley County, S.C., in addition to individual and area-wide farm soil surveys, improvement work included two group drainage projects with special Agricultural Conservation Program cost-sharing; special effort has been given to forest management and to conservation reserve cost-sharing; and Farmers Home Administration loans have been made to help the Rural Development Program cooperators.

In North Carolina's Bertie County, added SCS help was given on drainage and irrigation and in selecting fields for growing crops for a new produce market in this area. A farm forestry program, meanwhile, was being planned; and Bertie County interests joined with those of Northampton and Hertford Counties in seeking to start a small-watershed project.

Statewide, Tennessee reported 65,000 acres of soil mapping in rural development areas in five counties; 1,195 acres reforested; watershed project possibilities investigated in four counties; and approximately 400 farmers helped with their soil and water conservation problems. Also, soil and water conservation loans through the Farmers Home Administration were contributing to the program.

A 1959 Department of Agriculture superior service award to Tennessee State Conservationist Joseph R. Sasser of the Soil Conservation

Service was based in part on his interest in low-income farmers that "has resulted in more opportunities for better living through Rural Development Programs in five counties." The nomination pointed out that one RDP county increased strawberry yields through special land selection and on-site technical assistance and that another, with ACP aid, planted 450,000 trees during the past 2 years.

Water conservation understandably figures predominantly in Rural Development Committee reports from the West. In Washington's Stevens County, for example, interest centered in better drainage facilities in the low-income farm areas of the Colville Valley and in watershed projects. Fifty-five farmers along 18 miles of the Colville River organized the Chewelah Flood Control Association; and watershed project applications for Chewelah Creek and the Little Pend Oreille River received State approval in 1958, as had an application for a project on Mill Creek earlier.

In Bernalillo County, N. Mex.,—one of 9 counties in the rural development area in that State—major attention was given to water conservation and land-use measures, with special subcommittees working on problems of proper water usage, moisture requirements for crops, and better irrigation practices.



Farm pond with stock watering tank constructed on the J. F. Annis & Sons farm as part of the Rural Development Program in Butler County, Ky.



Land-use adjustments needed on dryland farms also are high on the list, with more participation urged in the Conservation Reserve Program to enable more families to take advantage of off-the-farm employment and increase their income. An additional 1,300 acres on the eastern side of the county in the dryland farming area was reported seeded to native grasses through the Soil Bank Program in 1958.

In these and the other states and counties over the country in which the Rural Development Program is spreading, the SCS is continuing to accelerate its soil survey, conservation planning, and help in applying soil and water conservation practices. It does so through working agreements with the state and county Rural Development Committees, if the committees believe there is need for this special technical help.

Rural development objectives are being realized, also, through community watershed and other undertakings outside of designated Rural Development Program areas. The Six Mile Creek "pilot" watershed project near Boone-

ville, Ark., is one example. More than half the farmers in this 165,000-acre tributary watershed to the Arkansas River were found to be part-time farmers, with some 300 having less than \$500 a year from farm income.

The watershed project has proved its worth in various ways. By 1956, 21 completed flood prevention reservoirs made available several hundred million gallons of water in that critically dry year. Availability of extra water storage in two of the reservoirs alone contributed to the decision of a comb company to locate a plant there, with a \$500,000 annual payroll for 200 employees drawn principally from surrounding farm areas. Meanwhile, farmers below the dams are able to develop water for irrigation; and the flood retention reservoirs hold back excess water at flood times.

Working closely with soil conservation districts and other local and state interests concerned, the SCS thus is best able to make a practical contribution to more efficient farming and increased income for Rural Development Area farmers everywhere.

# Modern Homesteading

By ELDO A. C. BETCKE

**H**OMESTEADING in the Magic Valley of southern Idaho has been going on for several years on the Minidoka Project of the Bureau of Reclamation, where to date about 800 new farms have been made available to veterans of the Armed Forces.

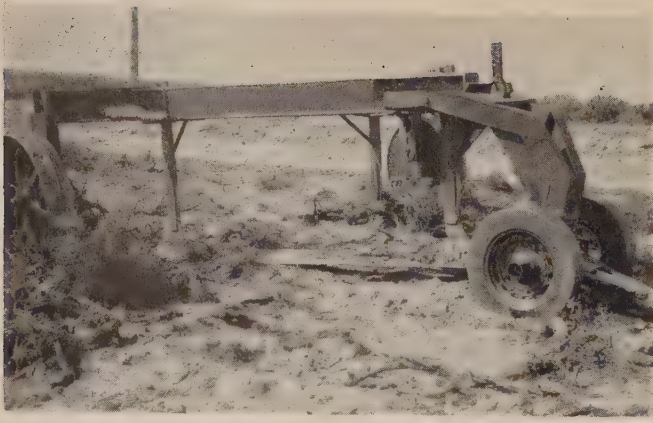
Unit "A" is a part of this project, and a large portion lies in Jerome County in the North Side Soil Conservation District. Water for irrigation is pumped from the Snake River.

Farmers of this area like to believe this is some of the most productive land in this part of the State and will develop into the finest farms in southern Idaho. The soil is deep, medium-textured, and easy to farm; but, is low



Typical scene of sagebrush on homesteaders land in Magic Valley at time of settlement.

Note:—The author is soil conservationist, Soil Conservation Service, Hazelton, Idaho.



Sagebrush crowner used for undercutting brush prior to clearing and leveling.

in organic matter after the brush is removed.

Homesteading has been a new experience for the families coming here from all over the United States. Most of them have had to dig deep and make sacrifices to take advantage of the opportunity offered them in the development of these new farms.

The Bureau of Reclamation made topographic surveys of the entire area to locate farm boundaries, canals, and laterals, which enabled them to deliver water to the high point of each farm. The majority of the farms are not divided by straight lines, but by drainage ways and high areas on which the canals or laterals are located. Most of the farms have only one headgate, through which the irrigation water for

the farm is delivered. Boundaries were laid out so that each farm would have approximately 100 acres of irrigable land.

Drawings for these farms were held at Rupert, Idaho each year for the number of farms that could be made available. Veterans of the Armed Forces with the required amount of farming experience and financial resources, filled out applications and mailed them to the Bureau of Reclamation at Rupert. The name of each eligible applicant was placed in a capsule. Capsules then were drawn to determine the sequence in which each man would select his farm. The entrymen were given ample opportunity for field inspection of the farms so they could make a selection when their turn came.

It was quite simple up to this point, but from here on the new homesteader was on his own in developing his farm. A big problem that homesteaders had to solve was to find a place to live, either in town or on their new unit, while they were making a start. Many trailer houses and even some tents could be seen on these farms in the spring of 1957.

The first step in the new venture was clearing the land; then came the building site selection, land leveling, field layout, ditch construction, and planting of crops. To many of the homesteaders, irrigation was a new experience and new farming methods had to be learned.



Tractor drawn carryall moving dirt on a land leveling job in Magic Valley.



It was apparent from the start that those who came to homestead these units were willing to make the necessary sacrifices and to put in long days of hard work to make a success of their new venture. Clearing the land of brush opened it to the full force of southern Idaho winds, and housekeeping in those days was an endless task for the housewife as the fine particles of dust penetrated everywhere.

Financing the new venture seemed to be the biggest obstacle for most of these families. Clearing and leveling the land was not the back-breaking work of pick and shovel and horse-drawn scraper of 50 years ago, but required a considerable outlay of cash to hire modern clearing and leveling equipment. Many of the neighbors exchanged the use of farm machinery in order to cut down on individual expense for the equipment needed on each farm. The average investment in one of these farms is \$18,000 to \$27,000.

Sixty-two of these farms are located in the North Side district, and in the last 2 years 43 of the homesteaders have become cooperators with the district. It has been a pleasure to work with the homesteaders who have become co-operators of the district because they are eager to use the services of the Soil Conservation Service in leveling, field and ditch layout, cropping information, and any other help we could give them.

SCS technicians, with the help of the farmers, set up guidelines to assist in staking the units on a 100-foot grid. When the staking was completed, a survey of the entire farm was made



John Ottman and family on the front steps of their new home.

and the leveling and ditch-layout plans were made from this survey. Some of the homesteaders did only the most necessary part of the leveling the first year. To reduce duplication of effort, a plan was made from the survey so that the cropping system and later leveling would fit in with the leveling already completed.

Tree plantings for field and farmstead wind-breaks were made on two cooperator's farms in 1957 through the combined effort of the North Side district and the Idaho State Fish and Game Department. Both were almost complete failures due to rabbit damage. Another planting, with good survival, was made in the spring of 1958 on 11 of the farms.

It is interesting to learn what some of these men were doing at the time each was notified that he was a lucky winner of one of these farms:

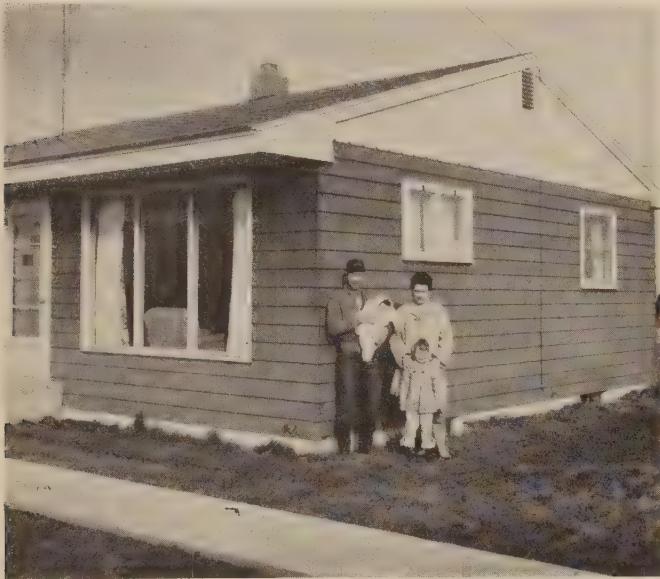
Robert Scott of Carnegie, Okla. was a student at Oklahoma State University, majoring in animal husbandry. He was taking final examinations when his wife brought him word that he now had a farm. They received the news with mixed emotions as it necessitated changes in their plans for the future. Bob was widely known for his hog raising project which began when he was an FFA boy in high school. He had exhibited animals at many of the large state fairs and livestock shows and has received offers of jobs from several of the large meatpacking companies. The Scotts are well established on their new farm now, and Bob is back in the hog raising business.



Robert Scott with some of his foundation stock for his hog farming project.



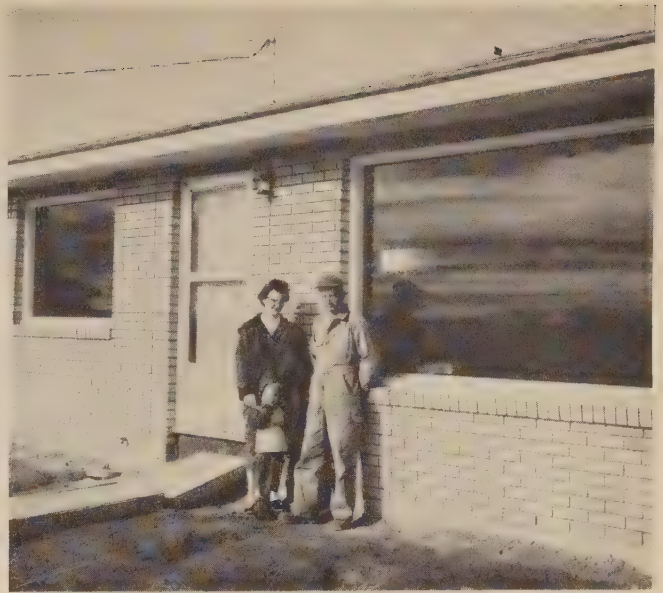
John Ottman was operating a 185-acre irrigated farm at Grand Junction, Colo., on which he was putting up hay when he received a letter notifying him that his name had been drawn for a farm unit. Ottman and his wife immediately made a trip to this area to look over the farms and were anxious to make the change after seeing the country. Their first home was a rented trailer house in which they lived until their new home was completed. His crops have been beets, potatoes, grain, hay, and beans. He has not definitely decided on a livestock venture, but he says it will be either sheep or cattle.



Steve Goodwin and family and their new home.

Steve Goodwin was operating a rented 160-acre farm near Carnegie, Okla. prior to coming to Idaho. At the time he received his letter saying his name had been drawn, he was selling cars in Dallas, Tex., after crops had been harvested. Mother Nature was very skimpy on rainfall in that area and crops had not been very good. The Goodwins were ready to make the change because it looked like a real opportunity to get ahead. Steve is still undecided on livestock, but thinks he will feed some cattle.

Leonard Mills was a Nebraska boy who had transplanted himself to Santa Barbara, Calif., where he was in the refrigeration and air conditioning business. He was at Rupert when his name was drawn at the official ceremony. It was a happy occasion for them, especially for Mrs. Mills, as her parents live at Twin Falls, Idaho. Leonard's crops have been beans, pota-



Leonard Mills and family in front of their new home.

atoes, peas, and grain. He is planning to go into hog production as a livestock venture.

Dave Anderst was employed by a construction company at Idaho Falls, Idaho when he received his notice. He made a dash around the trailer court, barefooted, telling the good news to everyone. Dave's farming experience had all been on dryland in North Dakota, so irrigation was a new experience for him. He has already made some extensive tree plantings on his unit through the cooperation of the North Side district and the Idaho State Fish and Game Department, and is planning to make more each year for several years.



Dave Anderst and wife beside some of the first trees planted on their homestead.



# CONSERVATION RESEARCH IN THE LOWER RIO GRANDE VALLEY

By J. R. JOHNSTON

## No. 48

This is the forty-eighth of a series of articles to appear from time to time in explanation of the various phases of research being conducted by the Department of Agriculture on problems of soil and water conservation.

ON October 27, 1958, B. T. Shaw, administrator of the Agricultural Research Service, gave the dedication address for the new USDA Citrus, Vegetable, Soil and Water Research Laboratory at Weslaco, Tex. Shaw stated that this research facility would permit

more productive research on the problems of soil and water conservation, and on problems confronting citrus and vegetable growers in this area.

The new laboratory is located on 3 acres of land at Substation No. 15 of the Texas Agricultural Experiment Station and deeded to the U. S. Department of Agriculture. The completion of this laboratory provides strengthened opportunities for cooperative research on soil and water conservation problems in the Lower Rio Grande Valley and similar areas in southwestern United States.

The three soil conservation districts in the

Note:—The author is area director for the Texas-Oklahoma-New Mexico-Kansas-Colorado area, soil and water conservation research division, Agricultural Research Service, Fort Collins, Colo.



The new citrus, vegetable, and soil and water conservation laboratory at Weslaco, Tex.



Lower Rio Grande Valley purchased a 50-acre block of land, 3 miles north of Weslaco, for the soil and water management phases of the new work. This soil and water research farm is operated under a Memorandum of Understanding between the soil conservation districts, the Texas Agricultural Experiment Station, and the Agricultural Research Service.

There are approximately 1,500,000 acres of cropland in the Lower Rio Grande Valley. About 700,000 acres are irrigated with the remaining 800,000 acres in dryland agriculture. The average annual rainfall varies from 18 to 26 inches per year from the western part of the valley to the coast.

Up to 1954, there was no water storage reservoir on the Lower Rio Grande River. In 1954, Falcon Dam and Reservoir were completed by the United States and Mexico. This reservoir has a total capacity of 4,085,000 acre-feet with 2,100,000 acre-feet of conservation storage, with 58.6 percent being allocated to the United States. This storage in Falcon Reservoir has firmed up the irrigation water supply for the valley in a major way.

During a joint Federal-State-soil conservation district research planning conference in August 1957, it was determined that the following soil and water problems were pressing ones insofar as irrigated agriculture in the Lower Rio Grande Valley was concerned: (1) Poor soil structure; (2) Inefficient irrigation water management; (3) Timing of water application in relation to the physiological development and condition of plants; (4) Correct use of fertilizer in relation to a varying irrigation water supply; (5) Loss of productive land due to salting out; (6) Problems of poor quality irrigation water; (7) Poor soil conditions for good plant root development and activity; and, (8) Soil compaction resulting from use of heavy farm machinery.

These listed problems along with state and regional Soil Conservation Service research needs statements have served as guidelines in developing the new research work in the Lower Rio Grande Valley.

When conservationists consider long-range stability and productivity of valley agriculture they conclude that: (1) the 1,500,000 acres of cropland is a nonrenewable resource, and (2) the surface water resource is subject to renewal



Aerial view of alkali spots on dryland farms in the Lower Rio Grande Valley.

on an annual basis. These maxims have been given due consideration in formulating the new soil and water research in the Lower Rio Grande Valley. It is recognized that on an annual basis the efficient use of irrigation water and rainfall for crop growth is of utmost importance. It is also recognized that on a long-time basis the prevention of saline and alkali soil conditions and the maintenance of soil productivity is imperative if valley agriculture is to remain productive.



Soil salinity (hot spots) cause an uneven stand of tomatoes on a dryland farm of the Lower Rio Grande Valley.



This expanded soil and water conservation research program in the Lower Rio Grande Valley has permitted strengthening of work on: (1) drainage and salinity control on both irrigated and nonirrigated lands, (2) soil structure improvement in relation to more efficient use of limited irrigation water, (3) irrigation water management in relation to stage of crop growth, and (4) improved fertility of soils in relation to sustained soil productivity and efficient use of water.

The ARS now has three engineers and four soil scientists along with supporting help at the new Weslaco laboratory. This staff, working closely with scientists in the Texas Agricultural Experiment Station, will be able to develop new knowledge on soil and water conservation problems occurring in the Lower Rio Grande Valley and similar areas in the Western United States.

The seed for this expanded soil and water research was planted in 1937, when the Texas Legislature enacted the State Soil Conservation Law authorizing the organization of soil conservation districts as political subdivisions of Texas. Since that time the people in the Lower Rio Grande Valley have continued to develop their conservation program. The new research

laboratory is a part of the progress of the valley conservation program.

In 1949, the Soil Conservation Service initiated a limited research program on irrigation water management in cooperation with the Texas Agricultural Experiment Station and soil conservation district cooperators. This research was very helpful in further development and refinement of level irrigation. Land leveling for irrigation water management became a major conservation practice in the valley in 1951-52. Since 1951, 165,000 of the 700,000 acres of irrigated land in the area have been leveled.

In 1953, the research division of the SCS was transferred to the ARS. In April 1955, during a soil and water conservation research review in the Lower Rio Grande Valley, soil conservation district supervisors requested ARS to strengthen soil and water research in the area. The soil conservation districts and other valley interests worked diligently for more soil and water research. The combined efforts of these groups and those concerned with citrus and vegetables resulted in the new laboratory and in increased funds for soil, water, citrus, and vegetable research.



Cotton preplant irrigation on water management plots on research farm at Weslaco.

# Hydrology in Soil and Water Conservation

By R. G. ANDREWS

This is the fourth and fifth of a series of articles that attempt to explain, in non-technical terms, the duties, responsibilities, and methods of Service hydrologists.

## Why a Hydrologist Computes Backwater Curves

FLOODS are caused by a combination of two conditions—high rates of runoff and low stream and river channel capacity. River channels, if undisturbed by man, naturally develop a capacity sufficient to contain the storm runoff that can be expected to occur on the average no more frequently than once in 2 years. This figure is significant because it means that on the average, rivers and major tributaries left in their natural state will overflow their banks 50 times in 100 years. The activities of man generally increase the rate and amount of surface runoff and decrease the capacity of natural channels to the extent that the frequency and severity of flooding are increased.

The evaluation of a flood prevention program begins with the determination of the capacity of the channels in a watershed. This requires that the location of cross sections be selected so that the hydraulic characteristics of a channel and flood plain are adequately represented by them. A field crew surveys the cross sections at the selected locations and plots the results of the

surveys on plotting paper ruled in a grid appropriate for the purpose. With these data and a meter to measure the velocity (speed) of the flowing water, a hydrologist could determine quite accurately the capacity of the channel at each cross section. This procedure would require 5 to 10 years of observations. Fortunately, there is a less time-consuming method of making the determination.

In 1889, an Irish engineer named Robert Manning presented a paper to the Institute of Civil Engineers of Ireland that contained a formula for computing the velocity of flow in open channels and pipes. The formula was subsequently modified into its present form, but still carries Manning's name. The formula is almost universally used, or misused, by engineers to compute the velocity of flowing water in open channels.

There is a symbol in the formula that represents the slope of a line (energy gradient) computed from the total energy of the water at various points along the stream. This fact is often ignored in the solution of flow problems and the slope of the water surface or of the channel bed used. The direct substitution of the measurable water surface or channel bed slope in the formula, except for special conditions of flow, leads to erroneous answers.

Water flowing in a channel gains kinetic energy (the energy of motion) as it progresses from a high elevation to a lower one; it also loses energy due to the internal friction of crosscurrents caused by the channel alignment, roughness of the sides and bottom, and obstructing debris. When the energy gained is exactly balanced by the energy lost, the flow is said to be uniform. For this condition the results obtained in the solution of Manning's formula by the direct substitution of measurable units will be as accurate as the estimate of the rough-

Note:—The author is head, central technical unit, Soil Conservation Service, Beltsville, Md.



ness of the channel. Uniform flow is a rarity in natural or dredged channels. Therefore, it becomes necessary first to make computations to determine if it exists. If it is found that uniform flow does not exist and Manning's formula is not applicable, one must resort to other methods of computing channel capacities.

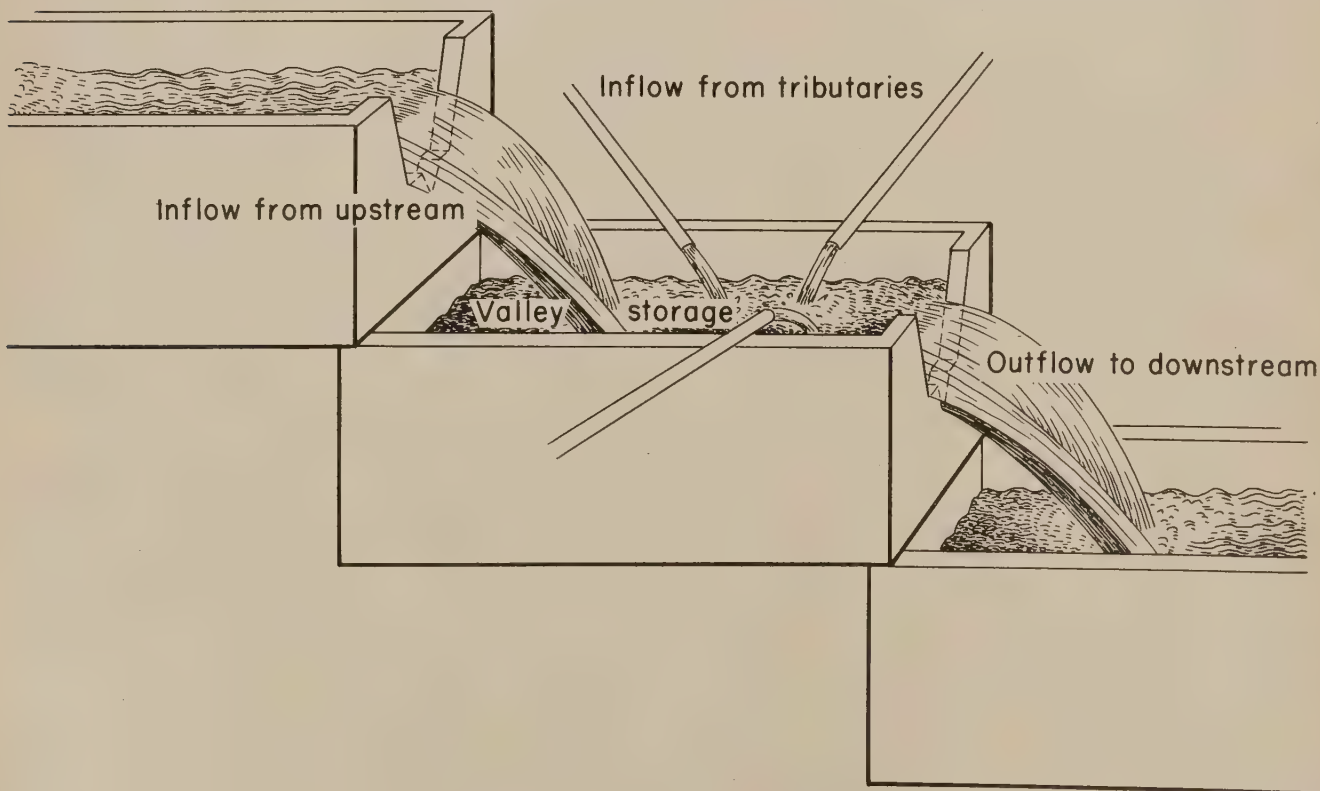
Daniel Bernoulli, in his "Hydrodynamica," published in 1738, introduced the analytical basis for what came to be called Bernoulli's theorem of the conservation of energy. This theorem states that the total energy contained by a stream of water at an upstream point is equal to the total energy at a downstream point, provided there is no loss of energy due to friction or work and no outside energy is added. By combining Bernoulli's theorem with Manning's equation for uniform flow, it is possible to derive an equation for the solution of channel flow problems when the flow is not uniform. Paul D. Doubt derived such an equation by re-evaluating and extending the work of Francis F. Escoffier. An algebraic solution of the equation requires trial and error computations which are much too laborious for practical application. Doubt's graphical solution requires that

the total energy for various depths of flow at a cross section be related to the total energy at the next upstream cross section. This relationship is graphically represented by a diagram known as backwater curves. The capacity of dredged channels, or natural channels and valleys, is computed rapidly and precisely by the application of the graphical procedure once the backwater curves have been computed.

Thus the computation of backwater curves is the only method whereby a relationship between the rate of flow and depth of flow in dredged and natural stream channels can be computed with sufficient accuracy, in the majority of watersheds, to develop a firm estimate of the average number of acres that are flooded annually.

## Why A Hydrologist Routes Floods

THE proper evaluation of a flood prevention program depends upon computing the number of acres of flood plain that are



Flood routing computes the balance of inflow, outflow, and storage in a valley.

flooded annually. This estimate depends upon the volume of runoff and the capacity of the stream channels and valleys. The prediction of rate of flow at a specific hour at any point in a stream system is accomplished by a procedure known as flood routing. The rate of flow is defined as the volume of water (usually cubic feet) that will pass the point in a unit of time (usually a second).

Flood routings are performed to: (1) predict the behavior of a stream during periods when the tributaries are discharging different quantities; (2) predict the behavior of a stream at any desired point; and, (3) predict the behavior of a stream after changes in channel conditions.

As previously explained, an SCS hydrologist computes backwater curves to develop a relationship between the rate of flow in a stream and the depth of flow at the cross section locations. This relationship is known as a section rating curve. The maximum depth of flow at each cross section for storms that occurred in the past is needed to compute the area of flood plain that was inundated. The maximum rate of flow at each cross section is computed by routing the storm runoff through the storage of the stream channel and valley system. The depth of flooding is obtained by applying the maximum rate of flow to the section rating curves.

In theory, flood routing is an accounting system as simple as balancing a checking account at a bank. There is a computed volume of inflow during a time interval (bank deposits), outflow during the same time interval (withdrawals), and water left in the system at the end of the time interval (bank balance). In actual practice, the accounting system becomes so complicated that a simple satisfactory approach has yet to be devised.

To continue the analogy, the bank deposits vary from minute to minute from each source (tributary); the rate of withdrawals also varies from minute to minute and is directly dependent upon the bank balance which is, in turn, dependent upon the relative rates of deposit and withdrawal. The withdrawals are not spent, but become deposits in the next downstream bank, which is also receiving deposits from tributary banks. The problem becomes one of computing the rate of inflow, rate of outflow, and storage at specific instants for any

one of numerous streams between two cross sections.

Thus by flood routing the hydrologist computes the past behavior of the stream and predicts the future behavior after the installation of a flood prevention program.

# GREAT PLAINS CONSERVATION PLAN IN NESS COUNTY

By WILLIAM B. SORENSEN  
and ORVAL A. HAROLD

ARTHUR PEMBER is the first Ness County, Kans., farmer to develop a complete conservation plan for his farm under the recently established Great Plains Conservation Program.

The objective of the Great Plains Conservation Program is to stabilize agriculture through a complete soil and water conservation program. The farmer or rancher and the Soil Conservation Service develop a plan of operation, which includes all of the conservation practices to be applied during the contract period. When this plan is completed to the satisfaction of both parties, the farmer and the Department of Agriculture enter into a contract. In effect, the contract is an agreement by the farmer that he will perform these conservation practices as scheduled, and that the Government will set aside the needed cost-share funds for the farmer to earn at the time he applies the practices to his land.

Arthur Pember farms in partnership with his father, I. A. Pember, of Ness City, who owns a 1,920-acre grain and livestock farm in the southwest part of Ness County. Mr. Pember has been interested in soil and water conservation for several years. Because his cropland had considerable sheet and gully erosion, he terraced 160 acres a few years ago. By building the ter-

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Note:—The authors are, respectively, work unit conservationist, Ness City, Kans., and Great Plains conservation specialist, Dodge City, Kans., both of the Soil Conservation Service.



racess, farming on the contour, and keeping as much crop residue on the surface as possible, he has reduced soil erosion to a minimum.

Pember is also interested in managing his grassland correctly. He found that to attain an even distribution of grazing, he needed additional stock water. With the assistance of his soil conservation district, the Soil Conservation Service, and the Agricultural Conservation Program he constructed two stock water ponds in the areas not being grazed as much as other areas.

More recently, Pember terraced two additional fields and part of another. During 1958, he shaped a waterway and seeded it to grass. Now, as in the past, his 906 acres of pasture are being consistently grazed with good management. However, much remained to be done on the farm before he could feel confident that it would be well protected from wind and water erosion.

Pember recognized the need for additional conservation treatment. The Great Plains Conservation Program afforded an opportunity to complete the program that he started earlier. The first step in developing the new plan was to review what had been accomplished and decide what was yet needed.

After studying the soil survey map of the land, he made a list of all the conservation practices needed. These practices when applied should give his land proper use and complete treatment for soil and water conservation. The



Arthur Pember (left) and William B. Sorensen in a draw that is to be made a grassed waterway on the Pember farm.



Pember stands near the center of one of the damsites for ponds to be constructed on his farm.

local Soil Conservation Service technicians assisted Mr. Pember by giving him information that would help him decide what he needed and wanted for his farm.

Mr. Pember decided that for the cropland he would need more terraces and several waterways to carry away the excess water from the terraces. Also, to keep more of the water on the land where it fell, he planned to establish a good system of crop residue management and contour farming. Not wanting to neglect his rangeland, he developed a long-time range management plan after getting information from an SCS range conservationist. He included in his plan proper range use, distribution of watering places with stock water dams, and some wind-break plantings for livestock shelter.

As the list was rather long, it was obvious, considering time and money, that it would be impossible to accomplish everything in 1 year. The next step was to decide in what order and in what length of time his plan could be completed. The Great Plains Conservation Program is designed for a 3- to 10-year period. Pember figured that with the planning and help he could expect from the SCS, he could complete his plan within 3 years.

To help in determining what projects he would do first, SCS technicians helped develop



a conservation map from an aerial photograph of his farm. On this map the fields were numbered so that the sequence of conservation work to be done could readily be seen. After considering the cropping and grazing sequences now in use, the following timetable was set up: In 1959, Pember plans to construct 2 grassed waterways occupying 17 acres, build 2 miles of terraces, plant 1 acre of windbreaks. In addition, he plans to practice contour farming and crop residue management on his 953 cultivated acres and proper range use on his 906 acres of rangeland.

In 1960 he plans to construct an additional 6 miles of terraces and build a stock water dam, while continuing all established practices. In 1961, he plans to construct an additional 13 miles of terraces and build another stock water dam.

As a result of the agreement with the Federal Government, Mr. Pember knows, for example, that money has been set aside in 1961 for cost-sharing on the construction of the stock water dam he has planned for that year, along with other practices on which cost sharing is approved. If adverse weather conditions should prevail or circumstances develop that cannot be controlled, causing the planned sequences to be changed, there are provisions whereby the contract can be modified.

When all practices of the conservation plan of operations have been applied to the land, assuming that prices remain the same during the contract period, the Government will have provided \$4,933.17 in cost-sharing. This will represent approximately 75 percent of the total cash cost of applying the conservation practices. Pember will make up his share with labor and an agreement to carry out a complete conservation program.

Upon completion of his plan of operations on December 31, 1961, Arthur Pember's land will be in top condition as far as soil and water conservation is concerned. By continuing with the maintenance of the applied conservation practices, he will have a sound program for years to come.

Mr. Pember commented, "I realize that to maintain my farm's productivity it will be necessary for me to have a complete conservation plan. The Great Plains Conservation Program gives me an opportunity to do this."

# LITTLE WOMAN IN A BIG JOB

By JACK PUTMAN

A 5-foot, 2-inch, 110-pound farm woman has been elected to a man-sized job as supervisor of the Caney Valley Soil Conservation District—the first woman ever to be named to the post in Oklahoma.

Mrs. Margaret Riney, Bartlesville, led the ticket against five men in the district election last spring—garnering 103 votes, 26 more than the nearest contender, Dick Bennett, her son-in-law.

Officials confirmed the vote count which put Mrs. Riney in, along with Bennett and Jim Wolfe, Collinsville, who ran third in the election to name three supervisors.

While the farm woman professed surprise at her election, it came as no surprise to the women's auxiliary of the Caney Valley Soil Conservation District. Mrs. Riney credits the women for her election. "They got out the votes," she said.

She is no novice in soil conservation work. She is serving her second term as State president of the women's auxiliary of the Oklahoma Association of Soil and Water Conservation Dis-

*Note:—The author is farm editor for the Tulsa Daily World, Tulsa, Okla.*



Mrs. Ed Biggerstaff, Mrs. Ray White, and Mrs. A. H. Riney display some of the Soil Stewardship Week posters put out by the Caney Valley Soil Conservation District.



tricts. Before that she was vice president 2 years, helped organize the Caney Valley auxiliary in 1956, and served as president 2 years.

But she has come a long way for a city woman who "had never seen a farm" until 15 years ago and didn't want to move to the farm in the first place.

Her husband, A. H. Riney, was vice president in charge of engineering for a large petroleum company, talked his wife into moving to a 300-acre farm south of Bartlesville with their three daughters in 1944. She "rebelled" for the first 6 months, refused to take an interest in the farm and spent most of her time in the city.

But then she saw "things weren't going right" on the farm with Riney gone much of the time. "I was never the type just to sit. I like to grow things," she said. Her yard in the city had nearly always won first prize.

When her husband offered to buy her 66 baby turkeys, she agreed. She raised 45. The next year she got 800 turkeys.

From then on she grew 1,500 turkeys a year and built a thriving market for her turkeys in Tulsa and Bartlesville. But she still took little interest in the farm.

In 1948, Riney suffered a stroke which left him an invalid. Management of the farm fell to her—but she wasn't prepared to cope with it. The place grew up in weeds. A 1,500-acre

bluestem ranch at Ochelata, which she leased out, was badly over-grazed.

The hired man on the farm, when she asked, "Shouldn't you be doing something" always answered, "It's just not time." "I was too dumb to know the difference," she said.

But one day she got in her car and drove south on the backroads. "Every place I found a farmer in the field, I stopped and plied him with questions—how deep was he plowing, what was he planting—why?"

Almost as by an act of providence, she came out on U.S. 75 at the south edge of Washington County. The first sign she saw was "Caney Valley Soil Conservation District welcomes you."

"I'll bet those people will tell me what to do," she said to herself.

The next morning she was camped on the Soil Conservation Service's doorstep at Bartlesville—and "has been camped over there ever since."

She learned for the first time that her husband had a conservation plan on the farm. Charlie Kilpatrick, SCS head, and others helped her establish crop rotations, shift cropland to pasture, stop overgrazing of her grassland. Today, she claims the 1,500-acre Ochelata ranch "has the finest bluestem grass in Oklahoma," because it has been taken care of. She grazes it now with her own 100 Hereford cows.



The board of supervisors of the Caney Valley Soil Conservation District (left to right): R. J. Bennett, James E. Wolfe, Walter M. Sears, H. Roy Cunningham, and Mrs. A. H. Riney.

Her husband had been a leader in getting Hulah Dam built while he was head of the agriculture committee of the Bartlesville Chamber of Commerce and had been instrumental in arousing interest in an upstream watershed pilot project on Double Creek before his illness.

She became interested in the Double Creek project. In 1954, it appeared the project might fold because an easement couldn't be secured on a 210-acre farm where the No. 1 damsite was to be built.

The owner wouldn't give the land, but offered to sell. Mrs. Riney took 300 shares of petroleum stock to her banker and told him to sell them so she could buy the farm. She paid \$90 an acre for the land and gave the easement for the damsite. The project went on to completion.

"It sure cost me," she said. She didn't need the land—but the project "was good for the community."

That same year Mrs. Riney attended her first national convention of the National Association of Soil Conservation Districts at New Orleans and has been to every one since, except this year.

The only reason she was willing to have her name placed on the ballot as a soil conservation district supervisor "was for the women," she said. "I think it's good to have a woman on the board, to get her point of view. It's a step forward, and I think it will stimulate the women to know that one of them can be elected a supervisor."

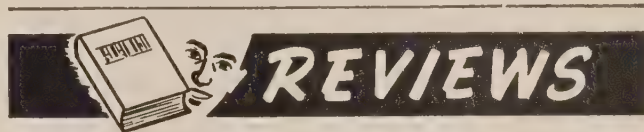
"My bridge playing friends think I'm crazy, but I like what I'm doing. Women must establish themselves as leaders; must educate themselves and not wait for the men to ask them."

"Women owe it to themselves to become interested in their business—because they don't know when they will be left with the whole responsibility," she said.

She would like to see the women become more interested in soil conservation district auxiliaries. There are now only 37 active auxiliaries in the state—17 in the northeast section. Caney Valley's auxiliary has 36 active members who meet once a month.

Mrs. Riney manages her farms with the help of a hired farmer, does everything about the farm except drive a tractor. She raises chickens and keeps a big garden. "Digging in the soil is good for me," she said.

She spends a good deal of the time on the road in her soil conservation work, takes care of her invalid husband and still finds time to serve as a "Gray Lady" one day a week at Eastern State Hospital at Vinita. She is active in the Bartlesville Pilot Club and American Cancer Society. She has eight grandchildren.



**LIVING EARTH.** By Peter Farb. 178 pp. Illus. 1959. New York: Harper & Bros. \$3.75.

"THE story of the marvelous abundance and complexity of life within the soil beneath us," the dust-jacket says, is the theme of Peter Farb's first book. It is a fascinating story vividly told.

Many conservationists know Farb as the author of lively articles about snow surveys, watershed projects, and other conservation topics in such magazines as *Reader's Digest* and *Coronet*. They will be glad to see his reportorial talents turned upon another subject of such profound importance.

Farb takes his readers right into the subterranean scene and shows them the details of the "soil-scape": the labyrinth of chambers and passages in which the tiny denizens of the dark world live. "The incalculable numbers of the soil population do not live *in* the soil but rather *between* the soil grains."

He brings us face to face with the curious forms of life that make up the soil community. He explains their bizzare habits and social organizations. Bumblebees, ants, and termites become as real to us as horses, cows, and songbirds in the above-ground landscape. We see such microscopic creatures as nematodes and bacteria, and even the submicroscopic bacteriophages, as individuals going about the intricate routines of daily living.

The book is divided into three main parts describing in turn the soil life of forests, grasslands, and deserts. In each division the author introduces the principal characters of the soil biota, always with keen awareness of their interrelationships to one another and to their physical environment.



One cannot read these fascinating stories without wondering a bit about the meaning of it all. Farb gives his answer in two brief final chapters. The big lessons are: (1) the prevalence of "symbiosis" or mutually beneficial partnerships in nature, and (2) the crucial role of the soil in the cycle of life—what the ecologists call the ecosystem.

Living together is more important than living apart, Farb concludes; symbiosis is a more basic law of life than the survival of the fittest. ". . . it is not so important who eats whom—but rather who lives with whom. If there is any secret to survival on the part of the beings underfoot, it may lie in mutual cooperation rather than destruction of other organisms."

The final chapter is a moving statement of the concept of the ecosystem—the interdependence of the living and nonliving. "The soil is the seat of abundance on earth, a massive machinery for keeping the chemical stuff of the

planet in constant circulation. There can be no life without soil, and no soil without life—they are inseparable."

Strange as much of the story is, it has the ring of authenticity as a report of things actually seen. If this is not enough, the reader can take confidence from the names of prominent authorities—some in SCS and the Department of Agriculture—with whom the author consulted, and the list of books he used as references.

Superb photographs by Roman Vishniac supply visual images to give the descriptions reality.

"Living Earth" is a first-class nature book with an important conservation message. It will be welcomed both inside and outside the classroom, for it is both instructive and entertaining.

—BEN OSBORN

# New Homes For Wild Ducks

By C. F. KEKKO

**W**ILD birds and animals are "taking over" scores of new farm ponds created in Upper Michigan's "Copper Country" in the past 4 years. Nobody minds, though, least of all the farmers who are getting an unexpected bonus from their water storage projects.

A wave of pond construction that began in the fall of 1954, when farmers were hit hard by drought, has resulted in 137 new ponds in the Houghton and Baraga Soil Conservation Districts and Keweenaw County. They are located in the Keweenaw Peninsula, more popularly known as the Copper Country. Though constructed mainly to irrigate strawberries and potatoes and furnish water for livestock, these new water areas are being widely used by a variety of game animals and birds.

Ducks, geese, and white tail deer are most commonly seen, but other game like partridge,

rabbits, muskrats, otter, and even bears, have been spotted making use of the ponds.

All these new ponds add up to 70 acres of new water surface plus a lot of good wildlife habitat in the surrounding areas. While this additional water surface was being created, no standing water of any kind was drained by landowners in applying soil and water conservation plans.

The Soil Conservation Service furnishes technical help on ponds for livestock water and irrigation. Cost-sharing through the ACP has provided further incentive.

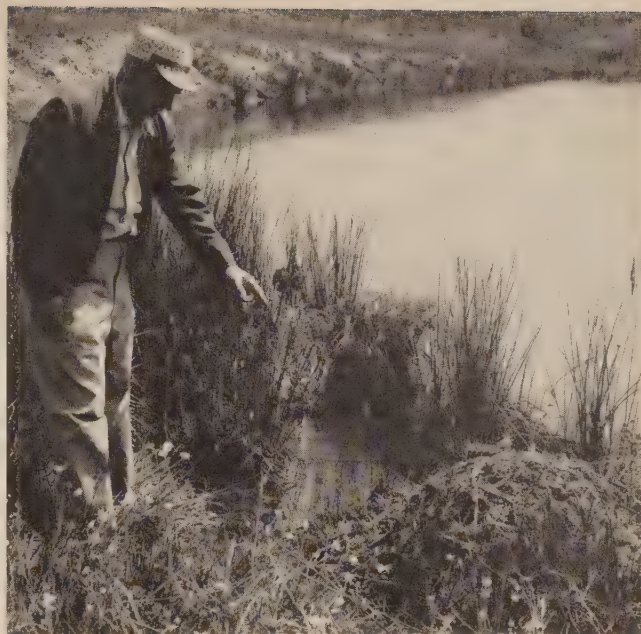
Ponds, of course, are only one part of a complete soil and water conservation plan for a farm. They are more effective when the proper supporting practices are used on land draining into the pond—practices like adequate cover and fertilizers, sod waterways, diversions, and strip cropping. These conservation measures have proved beneficial to wildlife.

Note:—The author is work unit conservationist, Soil Conservation Service, Hancock, Mich.

During recent years cooperators in the Houghton and Baraga Soil Conservation Districts have developed about 150 miles of sod waterways, called "grassed ditches" by many of the local farmers. These have been constructed mainly to intercept underground seepage water which creates a problem on the Munising soil type. This soil type predominates in the Copper Country area. The waterways were also constructed to provide safe disposal of water from sloping land. A lot of this water that used to be lost or that went on to the already flooded main rivers is now stored in farm ponds or reservoirs. The snow melt in the spring is usually rather large (282 inches of snow fell during the winter of 1950 with 150 to 175 inches about the average).

The new water areas, like agricultural lands, are well scattered. In between are wooded areas. In one community called "Paradise", south of Houghton, are some 15 of the ponds. I talked there with Rudy Larson and Cy LaTendresse, cooperators with the soil conservation district. They told me that a flock of ducks spent last summer flying from one pond to another. If something happened to frighten them in one pond, they moved on to another.

Many in this area reported broods of ducks hatched out on their ponds. Ray Jarvi, strawberry grower in Keweenaw Bay, reported two



New muskrat pile that appeared on a pond soon after construction on the Oscar Walker farm near Chassell, Mich.

broods hatched out on his large pond last summer.

In the Calumet Golf Course area, Hjalmer Olson and his neighbors, the Harma brothers, William Hammary, and Emil Tossava, all report ducks and geese flying back and forth between their ponds last summer. Hjalmer's comment: "I can't figure what they found to eat



Strawberry irrigation pond owned by Bill Neimela, Dollar Bay, Mich., that harbored ducks and geese during 1958.



CHANGE OF ADDRESS SHOULD INCLUDE ZONE, OLD ADDRESS, AND CODE NUMBER.

from the bottom of the pond, but it sure made them grow and they were fat. We found out this fall." Hjalmer and his son managed to harvest a few ducks during the recent hunting season.

On the Skanee road, out of L'Anse, is the former Henry Ford farm. Ford owned a sawmill in L'Anse and used the farm for his various experiments. Now owned by Carlo and Harold Heikkinen, the farm contains 740 acres, almost entirely surrounded by woods.

The clearing used for beef cattle and strawberry production is a paradise for game. Deer drink regularly from two farm ponds and the pond edges are full of deer tracks. Being able to get water here saves them a 3-mile trip down to the Silver River below. Carlo Heikkinen, member of the Baraga SCD board stated, "The

ponds have already paid for themselves by the habitat they have provided for deer, ducks, and other wildlife."

On the Oscar Walker farm in Worham, muskrat piles appeared soon after the pond filled with water. This also has been true of a number of others. Ed Peters of Chassell has an irrigation pond located in the woods about 500 feet from the edge of his strawberry fields. "I hardly ever walk to the pond that I don't see some game near it," he said, "especially deer and rabbits; twice I have seen a bear." Ducks too have used the pond.

Fish are becoming plentiful too. Several of the spring-fed ponds have been planted to trout while others are used to supply bait fish for sportsmen. For some, the bait fish business is becoming a profitable sideline.

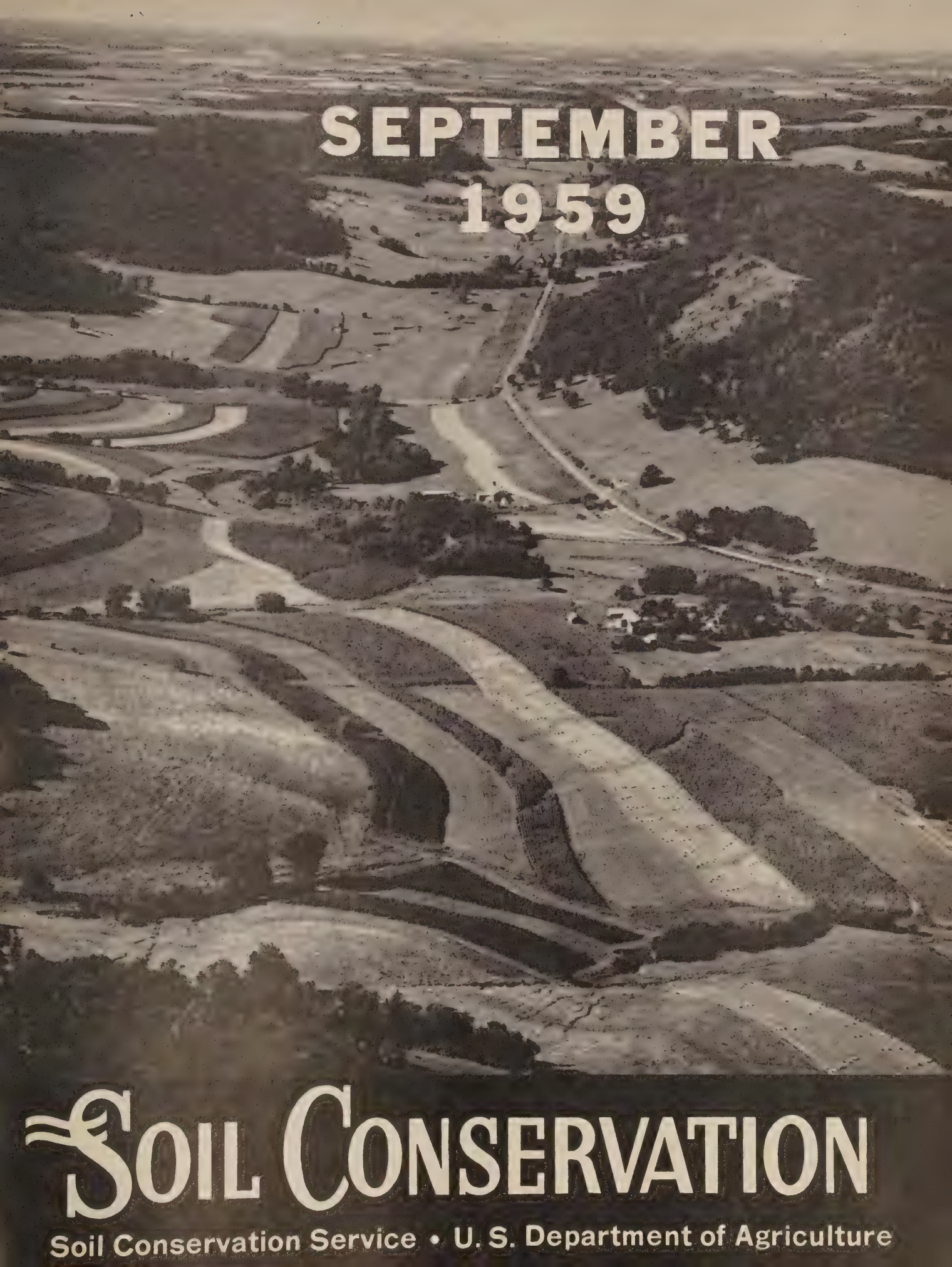
Although the primary reason for construction was irrigation and livestock water, the wildfowl and animals have shown that they appreciate this "extra" water. All of the ponds in the Copper Country are relatively new. As more of the grass and shrub cover grows up around them, it is expected that even more wildlife will find them useful. Judging from present interest, it is almost certain that the number of ponds will double during the next 4 years. This should add another 70 acres of new water surface widely dispersed throughout the area and step-up the population of game animals.

All in all, farm ponds have created a lot of interest in the Copper Country. Townspeople as well as farmers are watching to see what effect the ponds will have in their future hunting and recreation plans.



Ray Jarvi, Keweenaw Bay, Mich. points to where two broods of ducks hatched out near his pond in 1958.



An aerial photograph of a rural landscape. The image shows a patchwork of fields, some of which are divided by winding roads or paths. There are clusters of trees and shrubs scattered throughout the landscape. The overall tone is sepia or aged, giving it a historical feel.

**SEPTEMBER**  
**1959**

# **Soil Conservation**

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# SOIL CONSERVATION

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**DONALD A. WILLIAMS**  
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U. S. DEPARTMENT OF AGRICULTURE, WASHINGTON, D. C.

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TOM DALE, Editor

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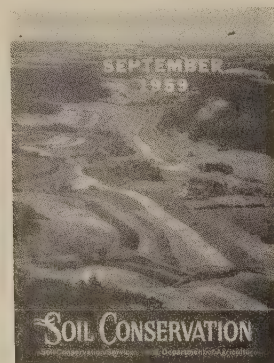
**THE INDUS VALLEY.**—One of Man's earliest civilizations arose in the Indus Valley. Like the contemporary civilizations in the Nile and Euphrates Valleys, it was based on irrigation agriculture. The perennial flow and semiannual floods of the Indus River supplied the irrigation water that enabled men to build cities, become civilized, and prosper for more than 15 centuries in this arid environment.

As the foothills of the Hindu Kush and Himalaya Mountains were deforested, floods and siltation increased and both flood and irrigation problems became acute. Archaeological findings indicate that some of the ancient cities were temporarily abandoned on account of floods at least twice before their final downfall.

The extinction of this early Indus civilization came about 1700 B.C., apparently as a result of conquest by the barbarous Aryans who sacked the weakened cities and brought on a "dark age." A new civilization arose in the lower Indus Valley a few centuries later, and through all the vagaries of wars and conquests survived until about A. D. 1200.

In the meantime, the Indus River became increasingly hard to control. The silt carried by the river built its bed and alluvial plains higher and higher; floods became more frequent and drastic; the course of the river shifted frequently.

(Continued on page 35)



**FRONT COVER.**—Pleasant Valley, Minnesota, as seen from the air.

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# Reseeding Depleted Range

By EARL SPENDLOVE

**T**HE Heaton brothers, Vard, Lloyd, Gail, and Ross, had real feed troubles before they started seeding their worn out range and managing it better—steps that reaped some eye-opening and money-making gains.

Take the spring of 1953, one of the driest in southern Utah annals. That season, the brothers grazed 900 sheep for about 2 weeks on 200 acres of new grass. A few years back the same land “wouldn’t turn out a lick of feed.”

Since then range forage has been getting better and better. Calves born in the spring average 370 pounds when they go on winter range in October. Lambs born after May 15 average 80 pounds, 20 pounds more than 20 years ago. This year the lamb crop ran 125 percent, the calf crop 98 percent.

Note:—The author is work unit conservationist, Soil Conservation Service, Nephi, Utah.

For their range building, the Heatons were presented the 1958 Top Rancher of the Year award by the School of Forestry of Utah State University.

The Heatons maintain a breeding herd of 150 cows and 2,500 ewes and each fall purchase steer calves to be wintered with their breeding herd on public and private lands on the “Arizona strip”, that portion of Arizona lying between the Colorado River and the Utah State line. The number of calves purchased depends upon the feed on the winter range at the end of the growing season. All calves except those kept to maintain the breeding herd are sold in the spring. Lambs are sold in the fall.

The breeding herd, together with spring-born lambs and calves, spend about 2 months on the Heatons’ privately owned range in the spring and about a month again in the fall. During summers they graze National forest land.



A part of the Heaton ranch that was converted from sagebrush to good grass by reseeding.



Early settlers in this area often turned out too many stock too early in the spring. Before they realized it, many of the native grasses and good browse disappeared. In their place came sage and rabbit brush, juniper, and pinon. Topsoil eroded from slopes and gullies moved in and drained the meadowland along creeks.

A good many ranchers face this problem of getting grazed off areas back into production. The dire need for feed spurred the Heatonson.

Vard Heaton explains things this way: "One of the first moves we made was to reduce our per acre stocking rate by buying more land. Next we filled up gullies at the bottom of drainages, dammed 'em up to hold back silt. Then we went after our scanty spring-fall range. We scattered seed among the sagebrush and oak from horseback as we worked the stock. This seeding failed because we didn't cover the seed and because it had to compete with the brush for moisture and plant food. That ended our plantings for some time."

In the next few years the brothers worked out a conservation plan with the Kane County Soil Conservation District. Among other things, the plan called for clearing land before seeding, plus no grazing until the grass was well along.

In the fall of 1949, the Heatonson tried again. They picked a fenced area south of Alton, where the elevation is about 7,000 feet and the rainfall about 17 inches. Here the heavy clay soil produced a thick stand of pinon and juniper with little vegetation under the trees—real tough going for range grasses.

Brush and trees were bulldozed into windrows. Part of the land was plowed and a mixture of smooth brome and crested and western wheatgrasses broadcast and harrowed in. On the rest of the land, seed was drilled directly into the soil after trees were pushed off.

To use spring and winter moisture, which is usually dependable in this area, the seeding was done in the fall so seed would be in the ground and ready to grow as soon as the weather warmed up in the spring.

Next summer, a thick stand of weeds covered the seeded area and the Heatonson figured they had failed again. On closer examination, they found a lot of grass growing in the weeds. And there was more grass in plowed than unplowed areas. This good seeding started the Heatonson off on a year-to-year seeding program. Each year since then, 50 to 100 acres have been cleared and seeded, a total of about 1,000 acres to date. On many of these seedings, the Heatonson



On left of fence is part of Heaton ranch that was reseeded to improve grasses. At right is range that has been protected from grazing but not seeded.



have received financial assistance from the Agricultural Conservation Program.

Drilling is the rule now and they have given up the complicated mixtures they first tried because the stock grubbed species like intermediate wheatgrass and smooth brome into the ground before they made any use of species such as tall, crested, or western wheatgrass. More recent plantings have consisted of smooth brome or intermediate wheatgrass with a legume such as alfalfa or sweet clover. Planting a single species or planting species of similar palatability have eliminated a lot of the waste they had with their early mixtures.

Looking back on these seedings Vard says, "Making a set of seeding rules to fit every rancher's needs is like a dressmaker trying to make a dress to fit every woman's taste and pocketbook. Here are some ground rules we've found helpful:

"Before seeding make up your mind to give the area total protection until grasses are well established. This can be done by herding or fencing. In our case we found fencing to be best. We try to locate fences so that they will help us manage our range and work out grazing rotations after the seeding is ready for stock.

"Young grass plants are really tender and delicate and can't stand grazing the first year. We graze most of our plantings in the fall, after the second summer. We wait a third year if grass growth is slow.

"Getting the seedbed in good shape is a must. It depends largely on the soil and the ground cover. Land that has been farmed can be handled just as you would for planting small grain. Keep the land free of weeds during the summer, but give the soil a chance to firm up well before fall planting.

"We didn't have much luck seeding land that had been farmed for years. We think this was because crops had taken considerable fertility and soil moisture. Summer fallowing might help get a better stand on this land.

"We use a bulldozer or chain to kill brush and trees. Sometimes it takes a couple of times to do the job. We always plow the land after it is cleared to make sure we have got rid of all competition. Then, whenever possible, we use a drill to plant grass. It spreads seed evenly



SCS technician with Gail and Ross Heaton clip grass on reseeded range to show that it produces more than 5 times as much usable forage as unseeded range.

over the ground, covers it and gives a better stand of grass per pound of seed. Ground that is too rough or littered to drill is broadcast and covered with a harrow or brush drag.

"Be sure and plant more grass—not more weeds. The best bet is certified seed.

"You just can't hit on a grass to fit all conditions. I like Herefords for range cattle. Yet I know of places where Brahma and Brahma-Hereford crosses will do well where Herefords would starve to death. It's the same with grasses," Vard said.

"Our stock go for brome and intermediate and stiffhair wheatgrasses better than for tall and crested wheatgrass," Lloyd Heaton broke in, "but we have some alkali spots on our range where nothing will grow but tall wheatgrass and sweet clover."

To keep from killing out the better grasses, the Heatons use them as key species, and stop grazing a pasture when about half the forage is used up.

Until the spring of 1953, clover in the mixture was no problem. By the time sheep moved onto it, clover was mature enough so that there was no bloat. But a cold, dry spring held the clover back until it was just starting when sheep moved in. There were some bloat losses. In spite of these losses clover is liked because it produces a lot of feed and grasses seem to do better when grown with it.

Bloat is being whipped by using less clover in present plantings and delaying grazing until the clover is mature.



The Heaton's have also found a way of stepping up production of native range plants. They do it by selecting plants that produce the most and best feed, then managing ranges to favor these plants.

On steep, rough mountain ranges, browse is vigorous and healthy and more native grass is showing up each year. On the Arizona ranges, better grasses are definitely on the increase. The difference in their and adjacent ranges shows up for miles along the fence line.

One of the brothers' new projects is a seed increase plot undertaken in cooperation with the Kane County SCD. Amur strain of intermediate wheatgrass seed seems to do better than most other grasses in the area. They'll use Amur in future plantings.

Not long ago Gail Heaton remarked: "It's hard to say how much we have received in dollars and cents from our range seedings. They cost us from \$8 to \$30 per acre. We do know that the plantings increased carrying capacity of sagebrush land from nearly nothing to 1½

cow months per acre. They gave us a dependable early spring feed when most needed. And we are using land that we merely trailed through before.

"The story is told too in the clippings my brother Lloyd and a Soil Conservation Service technician made on seeded and native ranges. They found that a seeded range, just after seed maturity the second year after planting, was producing 2,250 pounds of grass and clover per acre.

"Just over the fence on identical soil, native range was turning out less than 500 pounds of sagebrush per acre."

The Heaton's have carried out more range seeding than anyone in Kane County. Still they'll tell you they have only made a good start in turning brushland into good grass.

Ross voices the feeling of all the brothers. "We have spent a lot of time seeding our ranges. We think seeding pays and we'll keep on planting good grass and legume mixtures until someone shows us something better."

# PLANNING MAXIMUM INCOME IN SOIL CONSERVATION

By RUDOLPH A. CHRISTIANSEN AND JOHN R. SCHMIDT

## No. 49

This is the forty-ninth of a series of articles to appear from time to time in explanation of the various phases of research being conducted by the Department of Agriculture on problems of soil and water conservation.

THE level of farm income plays an important role in adoption of soil conservation practices. Farmers with a relatively low income tend to discount long-run income benefits. This kind of economic behavior may conflict with adoption of a soil conservation system of farm-

ing, particularly when it requires major changes in both the cropping and livestock programs. In addition, farmers at a low-income level tend to be more sensitive to changes in income or to the anticipation of such changes. As a result, they may choose practices that result in immediate higher income whether they be soil-conserving or not.

Relatively high-income farmers, however, can wait longer for increased income from conservation farming; therefore, they may be more receptive to adoption of recommended soil conservation practices.

As the level of income plays an important role in decisions farmers make, efforts should be made to minimize any "income drop" following adoption of a soil conservation system of farming. In doing this, the first requisite is to consider the available farm resources within the framework of an overall farm plan.

Note:—The authors are agricultural economist, Agricultural Research Service, and agricultural economist, Department of Agriculture Economics, University of Wisconsin, Madison, Wis.

The soil conservation program then becomes an integral part of such a plan. In this way, its implications on the farm business as a whole are taken into consideration. In addition, both conservation and nonconservation practices are considered in terms of their effect on income and capital requirements.

When income and capital are limited, there is economic pressure to allot resources to practices from which immediate monetary benefits can be obtained, even though soil depletion may be accelerated. In effective overall planning, careful consideration should be given to alternatives, and practices, timed to provide a favorable flow of income without eliminating the soil conservation goals.

Knowledge in the hands of farmers and farm planning technicians regarding the future or potential income of an individual farm, therefore, is most helpful for making favorable soil conservation decisions. This knowledge should be related to the particular soil type in question. Usually, such knowledge is general in nature; it must be used with sound judgement when applied to individual situations.

Preliminary results from research now conducted by the Farm Economics Research Division, Agricultural Research Service, and the Wisconsin Agricultural Experiment Station reveal that net farm income associated with specific dominant soil types can be increased materially by improving both cropping and livestock practices.

In this study, the farm business records for 195 farms were analyzed. All of the farmers involved were members of the Northwest Wisconsin Farm Management Association. The dominant soil types found on the individual farms were used as a basis for classification. In this way, the inherent differences in each type are reflected in the net income results. There were 12 dominant soil types on the 195 farms.

The average yields for the principal crops grown on the sample farms in 1953, 1954, and 1955 were summarized for the 12 soil types. In addition, the past rotations were determined from the distribution of the cropland as reflected by the crop history in the 3-year period.

For comparative purposes, recommended rotations were developed and expected yields estimated under the recommended levels of soil and

crop management. The recommended rotations were based on available knowledge of the designated soil types including degree of soil loss, slope length and gradient, and available land use capability indexes. It was ascertained that the recommended rotations would provide the greatest return to the farm without precluding adequate conservation of available soil re-

| Rotations and yields on 12 dominant soil types under past and recommended levels of crop and soil management |               |                |               |                |
|--------------------------------------------------------------------------------------------------------------|---------------|----------------|---------------|----------------|
| Soil type                                                                                                    | Past          |                | Recommended   |                |
|                                                                                                              | Crop rotation | Yield per acre | Crop rotation | Yield per acre |
| Santiago-Otterholt ---                                                                                       | C             | 65.4           | C             | 85.0           |
|                                                                                                              | O             | 50.2           | O             | 70.0           |
|                                                                                                              | HH            | 2.6            | HH            | 3.5            |
| Spencer -----                                                                                                | C             | 61.1           | CC            | 80.0           |
|                                                                                                              | O             | 48.8           | O             | 65.0           |
|                                                                                                              | H             | 2.8            | HH            | 3.5            |
| Waukegan ----                                                                                                | CC            | 67.3           | CCC           | 90.0           |
|                                                                                                              | O             | 53.4           | O             | 70.0           |
|                                                                                                              | H             | 2.9            | H             | 3.5            |
| Antigo -----                                                                                                 | CC            | 59.0           | CCC           | 85.0           |
|                                                                                                              | O             | 46.2           | O             | 70.0           |
|                                                                                                              | HH            | 2.5            | H             | 3.0            |
| Jackson -----                                                                                                | CC            | 69.9           | CC            | 105.0          |
|                                                                                                              | O             | 51.1           | O             | 65.0           |
|                                                                                                              | H             | 3.2            | H             | 4.0            |
| Dakota -----                                                                                                 | C             | 59.2           | CCC           | 70.0           |
|                                                                                                              | O             | 51.1           | O             | 55.0           |
|                                                                                                              | H             | 2.1            | H             | 3.0            |
| Onamia -----                                                                                                 | C             | 52.1           | CC            | 70.0           |
|                                                                                                              | O             | 54.6           | O             | 65.0           |
|                                                                                                              | H             | 2.0            | H             | 2.5            |
| Jewett -----                                                                                                 | CC            | 64.4           | CC            | 95.0           |
|                                                                                                              | O             | 51.4           | O             | 70.0           |
|                                                                                                              | H             | 2.5            | H             | 4.0            |
| Hines -----                                                                                                  | C             | 57.9           | C             | 90.0           |
|                                                                                                              | O             | 46.3           | O             | 65.0           |
|                                                                                                              | H             | 2.5            | HH            | 3.7            |
| Fayette -----                                                                                                | CC            | 63.7           | C             | 100.0          |
|                                                                                                              | O             | 44.9           | O             | 70.0           |
|                                                                                                              | HH            | 2.6            | HH            | 4.0            |
| Gale -----                                                                                                   | C             | 59.7           | C             | 75.0           |
|                                                                                                              | O             | 49.7           | O             | 55.0           |
|                                                                                                              | HHH           | 2.3            | HH            | 3.0            |
| Milaca-Freeon -----                                                                                          | C             | 59.0           | C             | 70.0           |
|                                                                                                              | O             | 41.3           | O             | 70.0           |
|                                                                                                              | HH            | 2.2            | HH            | 3.0            |



sources. The recommended rotations are based on the assumption that adequate soil conservation practices would be in effect on the 12 soil types involved.

The preceding table reflects the crop rotations and yields by dominant soil type under past and recommended levels of soil and crop management. It will be noted that corn has been increased in the rotation for some of the soils. This is permitted by reducing the threat of soil loss under the recommended soil and crop practices.

The projected average yields per acre are reasonable expectations that would result from adoption of the recommended soil and crop practices including compliance with up-to-date fertilizer recommendations, acceptance of needed soil conservation practices, and other modern cultural requirements.

Based on average yields per acre and percentage of land allotted to each crop as reflected by the rotations, total yields were obtained under both past and recommended levels of soil and crop management. In order to eliminate variations because of the different farm sizes associated with each soil type, a "typical" farm size was established based on census data and other available facts related to the sample area. Farm size was set at 185 acres; however, the amount of cropland was varied to meet the conditions of the different soil types. Thus, in all

instances, total farm size was constant, although land use within the typical farm was subject to variation depending on the use associated with the dominant soil types.

The crop production data obtained for specific soil types provides a base from which net income can be determined under different livestock situations. A number of different budgets were developed for varying levels of livestock management. Dairying and hog production provide the main source of income in the sample area. Budgets were developed for "7,000-lb. cows" (average annual milk production) and "average hogs," "9,000-lb. cows" and "average hogs," and "11,000-lb. cows" and "good hogs." The optimum livestock organization was budgeted for each type under both past and recommended cropping practices. A farm poultry flock of 200 hens was included in each budget.

The livestock situation involving 9,000-lb. dairy cows and average hogs approximates the existing situation in the sample area. The following table indicates that substantial increases in net income can be obtained on all soil types by improving crop practices and adjusting livestock numbers to fit the change in crop production. Although there is considerable variation between the different soil types, the differences in income are highly significant. The income drop often associated with the initial adoption of some soil conservation practices does not result in this area of Wisconsin when

Optimum net farm income expected with different levels of livestock management under past and recommended crop and soil management practices.

| Soil Type               | 9,000-lb. cows and average hogs |                               |                         | 11,000-lb. cows and good hogs |                               |                         |
|-------------------------|---------------------------------|-------------------------------|-------------------------|-------------------------------|-------------------------------|-------------------------|
|                         | Net farm income (past)          | Net farm income (recommended) | Recommended over (past) | Net farm income (past)        | Net farm income (recommended) | Recommended over (past) |
| Santiago-Otterholt ---- | \$ 7,263                        | \$ 9,588                      | \$2,325                 | \$ 9,136                      | \$11,064                      | \$1,928                 |
| Spencer -----           | 6,999                           | 10,031                        | 3,032                   | 8,777                         | 11,220                        | 2,443                   |
| Waukegan -----          | 10,269                          | 12,904                        | 2,635                   | 11,931                        | 14,044                        | 2,113                   |
| Antigo -----            | 7,931                           | 11,898                        | 3,967                   | 9,860                         | 13,169                        | 3,309                   |
| Jackson -----           | 10,079                          | 13,221                        | 3,142                   | 11,760                        | 14,884                        | 3,124                   |
| Dakota -----            | 7,522                           | 8,692                         | 1,170                   | 9,114                         | 10,071                        | 957                     |
| Onamia -----            | 5,915                           | 8,414                         | 2,499                   | 7,279                         | 9,617                         | 2,338                   |
| Jewett -----            | 7,896                           | 12,502                        | 4,606                   | 9,270                         | 13,506                        | 4,236                   |
| Hines -----             | 7,554                           | 10,013                        | 2,459                   | 9,465                         | 11,420                        | 1,955                   |
| Fayette -----           | 6,736                           | 9,876                         | 3,140                   | 8,387                         | 11,304                        | 2,917                   |
| Gale -----              | 6,656                           | 7,311                         | 655                     | 8,534                         | 9,147                         | 613                     |
| Milaca-Freeon -----     | 6,077                           | 7,367                         | 1,290                   | 7,949                         | 9,291                         | 1,342                   |

the livestock adjustment is made. Instead, the anticipated improvement in income provides a potent economic incentive for the adoption of recommended cropping practices and other desirable conservation measures.

Significant income improvements from adoption of recommended cropping practices would be anticipated as well with 11,000-lb. dairy cows and good hogs as shown by the preceding table.

Further comparisons can be made from the data in these tables. For example, if we compare the past income with 9,000 lb. cows and average hogs with the estimated income with 11,000 lb. cows and good hogs, the income differences are still more startling. In this instance we go from the actual situation to a high-management level including both improved livestock and recommended soil and crop management.

The authors wish to reemphasize the usefulness to farmers and farm planning technicians of reliable information concerning the income benefits that can be derived by shifting to recommended levels of crop management. In addition, information regarding the most profitable change in livestock numbers resulting from shifts to recommended cropping practices is needed to guide alternative enterprise selection and/or the expansion or contraction of existing enterprises. This kind of information should be furnished by types-of-farming areas based on dominant soil types.

Budgeted data of the kind discussed here are helpful as a guide when considered within the framework of the overall farm plan, a plan that includes both soil conservation and non-conservation practices. Only in this way is it possible to appraise with accuracy the income effect of good soil conservation practices and thereby hasten their adoption.

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**CONSERVATION FOR BETTER LIVING.**— Unless conservation makes for better living on the land—in the rural communities—larger opportunities for farm and ranch families and greater satisfaction with country life—the purpose of conservation is unlikely to be achieved.

ERVIN L. PETERSON  
*Assistant Secretary of Agriculture*

# ONE WAY TO IMPROVE STREAM FISHING

By R. D. ANDERSON, ELLIS SEDGLEY,  
and CLARANCE RUEHLE

EVERY fisherman likes action when he hangs a trout and R. E. Barbour is no exception. And when he takes his catch home, he doesn't like to feel apologetic for junior-size rainbows and cutthroats.

Barbour was having the usual luck one day a number of years ago while fishing Marvine Creek on his 628 acre ranch in Rio Blanco County, Colo. He was getting a few, but they were disappointingly small. Then Barbour had an idea. It set him to wondering.

Barbour calls his place the Marvine Ranch. The creek that crosses it averages 15 to 20 feet wide and about a foot deep except during snow-melt. Then it is a little wider and much deeper. The stream for most of its length is rapid and shallow. Parts that cross the ranch, however, are somewhat deeper. The snow-fed creek is always cold and sparkling clear.

The fish that Barbour was catching that day were seldom longer than 9 inches, never as long

Note:—The authors are respectively, soil conservationist, Denver, Colo., work unit conservationist, Meeker, Colo., and engineering aid, Meeker, Colo., all of the Soil Conservation Service.



Three rock dams constructed by Barbour on Marvine Creek.





Riprapping to protect banks on Marvine Creek.

as 12. The clear shallow water made them hard to catch.

Frequent stocking, Barbour knew, was one way to improve fishing; but, it was a never-ending process. It would never mean larger, more challenging fish, the kind Barbour liked to catch.

The more Barbour turned his idea over in his mind, the sounder it seemed. He figured that the best way to make fishing better was

to create better conditions for the fish to reproduce, live, and grow. It might be expensive, but Barbour pointed out to himself that it would be a once-over job and in the long run might actually cost less than piecemeal efforts. Certainly—and this was the clincher—it would make fishing in the stream a far more satisfying sport.

There were several things Barbour decided he ought to do. He would need to slow down the current and make more deep water. He would have to improve shelter and food for the fish. He would need to cut down on siltation by protecting the stream banks and make nearly all portions of the improved area easier to get to.

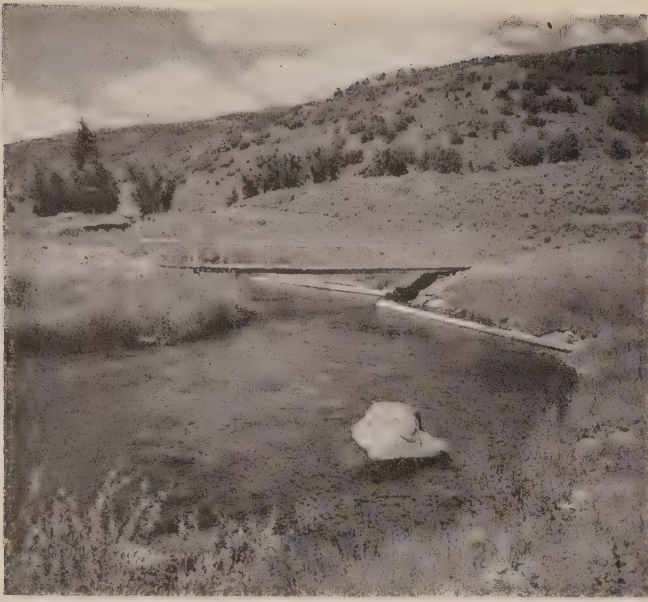
To slow down the stream, Barbour set out to make it meander as much as possible. He used a bulldozer and a dragline to build low rock and gravel dams. These were located at spots which forced the stream back into former oxbows. In doing this, he added about  $\frac{1}{4}$  mile to the  $1\frac{1}{2}$  miles of stream he formerly had.

In deepening parts of the stream Barbour used a bulldozer and dragline to make loose rock dams. These dams contain boulders from the size of a football on up. He tried to avoid piling



Meandering channel of Marvine Creek after Barbour improved it for better trout fishing.





The large rock in foreground provides shade and hiding place for trout. Anchored logs under foot-bridge also furnish shade and hiding places for fish.

up dirt and gravel. The rock dams, Barbour explained, have two advantages; they hold their own against the swift current and part of the water goes through and part over. Thus, there is little silting and clogging either above or below the dams.

Barbour also rolled large boulders into the stream to make cover and still water spots. In addition he anchored logs in some spots for more shade and still water. Trout can't swim against a current all day, Barbour explains. They need rest.

Where Barbour thought it was needed, he used riprapping to protect the banks. He spanned the stream with several small bridges, about 20 feet long, so that the creek could be fished readily from either side.

Barbour is well pleased with his work. The mile and three quarters stream length now has approximately 20 rock dams with holes ranging from 2 to 6 feet in depth. The large holes behind the dams and the rest pools offer far more favorable conditions for trout and trout food.

The stream portion on the Marvine Ranch has approximately three times as much water as unimproved sections, Barbour estimates.

And as for fish—well, Barbour and his invited friends now catch hustlers that run from 12 to 18 inches long and weigh from 1 to 2 pounds.

This is without stocking except for the dozen or so big ones, 2 to 4 pounds, that Barbour transferred from the lake on his ranch.

Barbour is confident that many a stretch of mountain stream can be helped this way. When the water is lowest in late summer it is easy to use a bulldozer or dragline. The machinery can go right up to streambed, picking up the scattered boulders and moving them into position.

Mr. Barbour has been a cooperator with the Upper White River Soil Conservation District since 1951. He has a basic plan on his Marvine Ranch and with assistance of the Soil Conservation Service technicians assigned to this district he has completed most of the conservation practices included in the plan. In addition to the stream improvement work he has leveled hay meadows, revised his irrigation system, used commercial fertilizers on his mountain meadows, and practiced good grass management.

## THE INDUS VALLEY

Continued from page [26])

Finally the inhabitants gave up the fight to control the river and use its water to irrigate the arid plains.

The ancient history of the Indus Valley became veiled in obscurity, and modern historians and archaeologists did not suspect the existence of the earliest Indus civilization until 1922, when they began unearthing the ruins of the ancient cities.

Today, most of the lower Indus Valley is relatively barren. Few people have lived on the sun-baked mud flats and shifting sand dunes in modern times. Some of the foundations of the ancient cities are now below the ground-water level. The river channel is at least 20 feet higher than it was 3,000 years ago, and overflows onto the nearby alluvial plains, which are lower than the river bed, during every flood period.

The climate in the Indus Valley is apparently the same as in ancient times, but the land is not the same.

Efforts are being made to reclaim this area, irrigate it, and restore it to something like its former productivity. This should be possible because there is still plenty of soil in the valley, even though most of it is erosion debris from the highlands. Nevertheless, reclamation measures, if they are to be permanent, must start at the headwaters where the floods and silt loads originate.

*Topsoil and Civilization*  
DALE AND CARTER



# Hydrology In Soil and Water Conservation

By R. G. ANDREWS

This is the sixth and seventh of a series of articles that attempt to explain, in non-technical terms, the duties, responsibilities, and methods of Service hydrologists.

## How a Hydrologist Helps in the Design of Floodwater Retarding Structures

**F**LOODS may be controlled at specific locations on a river system by levees, channel enlargement and straightening, large reservoirs, or any combination of the methods. Levees control floods by providing a safe spillway for a large shallow retarding reservoir upstream from the beginning of the levee system. Channel straightening and other measures control floods by increasing the speed of travel and the volume of water past a specific location. This method may create a flood hazard downstream from the end of the channel improvement work. Large reservoirs control floods by impounding water on one area of land to control the flooding of a presumably more valuable area downstream.

Floods may be prevented by reducing the volume and delaying surface runoff from the watersheds of rivers. The volume of surface runoff is reduced by land use practices that increase the rate at which precipitation will flow into the ground-water reservoir. Surface runoff is delayed primarily by floodwater-retarding structures high on the headwater streams.

Design problems of a floodwater retarding structure are unique in many respects. The structure must temporarily impound sufficient floodwater to reduce floodwater and sediment damage downstream, and it must be economically justified by those reductions; it must perform its design function automatically and be reasonably free of maintenance; it must be free from failure hazard, and quite often provide conservation storage for municipal, domestic, or irrigation water.

The hydraulic design of such a structure requires considerable professional skill and foresight. A watershed planning party hydrologist must determine the average annual area flooded by storms that have occurred in the past, and the area that would have been flooded if the structure had been in place to store a specific volume of flood runoff. From these figures and the cost of the structure, the economic justification of the structure is determined.

The hydrologist must properly proportion the detention storage and automatic release rate so that the emergency spillway is not subjected to destructive erosion. On the other hand, the release rate must not be so great that a large number of structures releasing water simultaneously will cause prolonged flooding or swamping of areas adjacent to larger river channels. The relationship between the detention storage, the maximum storage to the top of the dam (surcharge storage), and the capacity of the emergency spillway must be such that runoff from the largest storm that can reasonably be expected in the area will not cause failure of the structure. These pieces must be fitted together like the pieces of a jigsaw puzzle to produce the most effective floodwater-retarding structure for the least amount of money, at the site location where it will produce the most benefits—a challenge that will tax the ingenuity of most engineers.

Note:—The author is head, central technical unit, Soil Conservation Service, Beltsville, Md.

If the storage of municipal, domestic, or irrigation water becomes an additional function of the floodwater-retarding structure, the problems that must be solved by the hydrologist increase in number and complexity. He must determine the average volume of water that can be expected to appear monthly at the proposed point of impoundment. The losses to evaporation through transpiration, by water-loving plants and by seepage, must be evaluated and added to the water needed for beneficial use. The amount of water supplied by rainfall that will reduce the irrigation need must be computed. Finally, a water budget analysis similar to the financial statement of a bank or other business must be prepared to determine if there will be a surplus or deficit of water. If a deficit occurs, the percent of time that water will not be available for beneficial use must be computed.

The hydrologic design of a floodwater-retarding structure involves the consideration of all the problems that would be encountered in the design of a large reservoir. However, much data on streamflow and storm patterns available to the designers of large reservoirs must be computed indirectly by the hydrologist for a floodwater-retarding structure from a knowledge of meteorology, geology, soils, and other allied sciences.

## How to Evaluate an Engineer's Capabilities as a Hydrologist

**H**YDROLOGY is not an exact science in the same sense that meteorology is not an exact science. Positive, unqualified answers to problems are seldom, if ever, possible. It is truly a mixture of science and art—the art of combining scientific facts, observations, and experiences in the proper proportions to produce a well-balanced project.

Despite the rapid advances that have been made in hydrology since 1945, there are very few opportunities for an engineer to obtain for-

mal academic training in the science. Hydrologists must usually be trained on the job. The selection of an engineer for training in hydrology should be based upon the careful consideration of the special talents and personality traits required for the job.

Graduate engineers have been trained in the fundamentals of mathematics. However, due to deficiencies in many college curriculums, proficiency in applied mathematics must be developed by continued application and study. Statistical mathematics and analysis so important to the hydrologist are virtually nonexistent in engineering curriculums. Prospective hydrologists should have demonstrated a genuine interest in mathematics and analytical procedures. However, an overdependence on mathematics equations, especially statistical mathematical, to the extent that natural laws and limitations are not recognized, can be more detrimental than a lack of mathematical proficiency.

High on the list of desirable characteristics is intellectual curiosity—the constant seeking for the why of observed phenomena. Without intellectual curiosity the evolutionary progress that leads to improved methods and procedures is likely to be lacking, and the interrelationship of the varied allied sciences is never discovered. One who has developed a keen sense of observation and possesses the curiosity to compare and analyze that which is observed will add immeasurably to his store of knowledge.

A bachelor of science or bachelor of arts degree from a college or university certifies only that a man has completed certain educational requirements. A man who is inflexible, afraid to try new ideas, refuses to admit and thereby profit by his mistakes, or who cannot discuss impersonally proposed changes in procedures will not function harmoniously in a watershed planning party regardless of his educational background. A reluctance to accept arbitrary decisions, hastily assembled and poorly analyzed data, and crude estimates for other than reconnaissance reports is a sign of intelligence. Engineers selected for hydrologist training positions should have demonstrated the intellectual flexibility necessary to select analytical procedures commensurate with the degree of accuracy required for the completed project.



Engineers are taught that the greatest sin is inaccuracy. Measurements and computations are habitually made with considerable exactitude. Hydrologic computations when based upon the most accurate data available will contain a margin of error equal to plus or minus 10 to 15 percent. A margin of error equal to plus or minus 50 percent is not uncommon. Some engineers find it difficult to adjust to this type of operation and may react in one of two equally undesirable ways: they may become so frus-

trated in trying to reduce the inherent margin of error that little is accomplished, or they may conclude that an acceptable degree of accuracy is unattainable and become satisfied with crude estimates. The ideal personality is one that gathers and carefully weighs all the available data, makes necessary computations, recognizes and readily admits the margin of error, and accepts mistakes as the natural obstacles along the path to progress. The evidence of a mistake can be removed by an eraser or by the



A hydrologist must consider many things in his efforts to help construction engineers design an effective and economical floodwater retarding system.

more costly process of reconstruction, but once made it can never be eliminated and should be used advantageously.

A Service hydrologist is in the unique position of having to work with the most intimate details of flood prevention hydrology, yet he must never lose sight of overall flood prevention problems. He must have sufficient scope of vision to recognize the effect the recommended flood prevention program will have on a tributary stream, and the effect that the application of the program to many tributary streams will have on the regimen of the rivers. He must be

able to visualize the physical and social impact of a flood prevention program as it affects a tributary subwatershed, tributary watershed, river basin, or State to properly advise the administrative personnel on the hydrologic aspects of the program.

Hydrology is a dynamic science with many relationships remaining to be discovered. The progress of small watershed hydrology in the next decade will be determined largely by the intelligence of the young engineers now being assigned to planning parties as hydrologists-in-training.

# Drain Tile—How Are They Working?

By ROY E. TUTTLE

**H**OW effectively and how long do the buried tile pick up and move out the excess water? Many a farmer has looked and wondered. Jess Knutzen, farmer with dirt on his shoes, and a supervisor of the Skagit County Soil Conservation District near Burlington, Wash., stood looking out over the valley. His 240 acres of almost level land was beginning to feel the warmth of spring.

It was May 1958, and he was talking to Tony Harms, conservationist of the Soil Conservation Service. "Yes, Tony, I surely wonder sometimes how they are really working. I think that straw around the tile is good, but I don't know. One thing for sure, I have a lot better drainage here than in 1945."

Knutzen knew the fruits of good planning and making solid investments in the land. Year after year, beginning in 1946, he had installed thousands of feet of 6-inch tile. A ditch 3,900 feet long through the middle of the farm provided a good outlet. He had carefully maintained it through the years.

Following the customs in this delta of the Skagit River, Knutzen had consistently used

straw around and over his tile lines before backfilling with the rich loam soil. This was Snohomish silt loam soil, and it was good. When well-drained, it was second to none. Jess would tell anyone that he would not sell his land for any price—this was life as he knew it.

Almost since the beginning of the Skagit County district many farmers had year after year been installing tile lines. SCS engineer Maynard Parker had prepared location maps where the assistance to farmers was part of their conservation farm plan with the district. Occasionally, tile lines had been opened to check for silting, or lack of it. It seemed that no overall evaluation had been made by systematically opening many tiles that had been installed for years.

The ensuing discussion between the district supervisor and technician centered around the possibility of making many investigations of existing lines. The proposal was to check any deterioration of tile, acidity of the surrounding soil, and to investigate the condition of the straw blanket around the tile after several years' use.

Some farmers were known to have used wood

Note:—The author is a civil engineer, Soil Conservation Service, Seattle, Wash.



chippings. These were cheaper than buying baled straw. Several farmers believed chips would last longer. Either the straw or the wood is considered by farmers to have two purposes: (1) prevent fine soil particles from entering the tile joints and silting up tile lines and (2) increase ability of water to find its way from the soil into the tile. Graded gravel is desirable for this, but often is expensive and hard to move to the site of the open tile ditch.

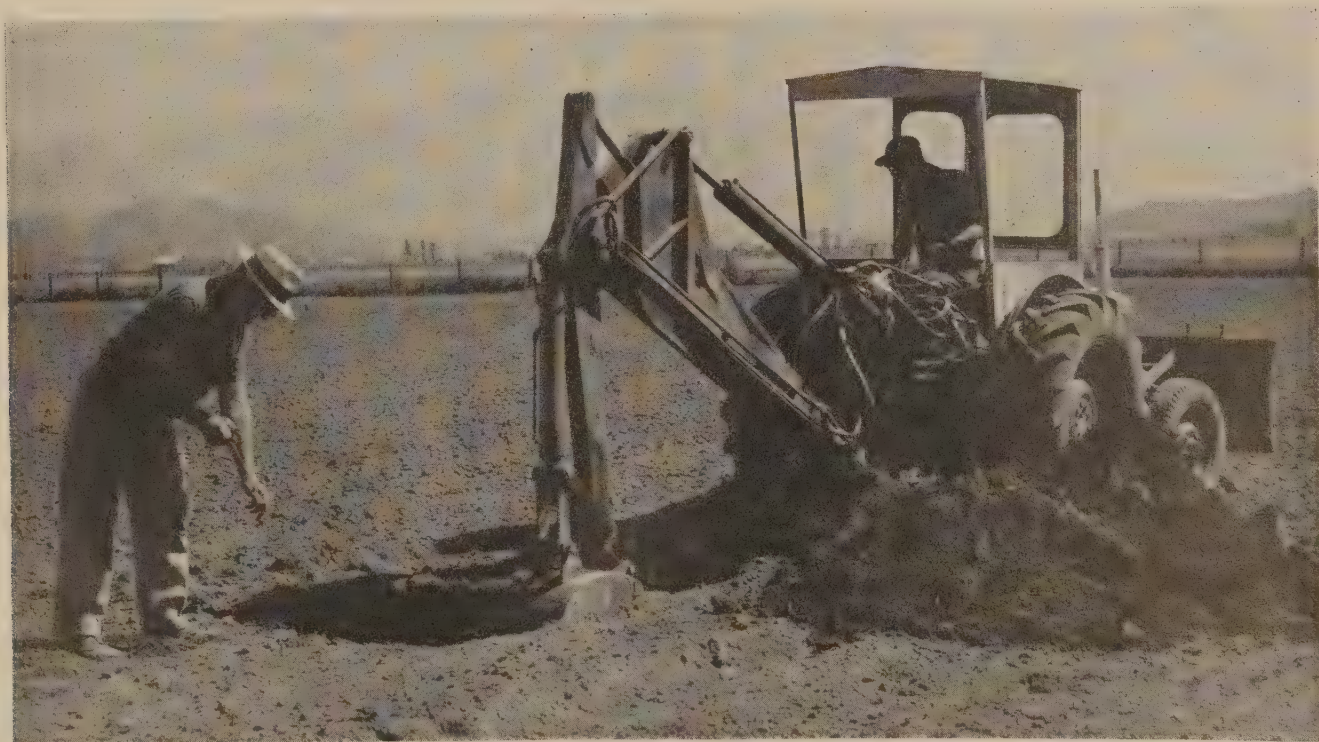
By the first of August, plans had been developed and the "look see" was set for the middle of the month. At this time the ground would be dry and no mud encountered. Six farms with different soil situations were to be investigated. Farmers were greatly interested and indicated, "Yes, I certainly will be here that day and see what seems to be going on in my tile lines."

Uncovering a tile line in many places during August is not easily and rapidly done with a shovel. The most enthusiastic worker is likely, in the hot sun, to slow down after one or two openings. Therefore, they decided to use a power machine that could be rented in the area. A large size, rubber wheeled machine with a backhoe mounted on the back was used. Able to travel at 20 miles per hour from farm

to farm, this made it possible to visit the six farms in a short time.

Copies of the maps made through the years were on file in the local SCS office. These and a measuring tape were used to determine the locations and alinement of the tile. A steel prod located precisely the position and depth of the buried tile. With the backhoe operating from a position parallel with the tile, a trench was made directly over the line. The skillful operator removed all but a few inches from over the long buried tile. A secondary trench was then opened parallel to this and extended 2 or 3 feet below the tile line. During the day and a half of work only four pieces of tile were broken by the machine. Interested technicians of SCS and farmers armed with shovels, knives, and hand garden spades leaped eagerly into the trenches and scraped soil from over and around the buried lines.

Careful removal of three or four lengths of the drain tile revealed many things concerning siltation, deterioration of tile, and cover over the tile itself. The extent of remaining straw and the wood chips was easily determined. Clearly visible on the "squared up" dirt wall was the outline of the original trench dug when the tile was installed.



SCS Engineer Earl Cowley holds steel probe on tile as excavation begins.





SCS engineers prepare to open a 10-year old clay tile on the Hulbert farm.

Following the taking of soil samples and acidity tests, the removed tiles (or replacement ones) were carefully put back in place. Only a few minutes was required by the machine to backfill and tamp the removed soil.

The oldest installation investigated was a clay tile line placed in 1935. Having been in operation for 23 years, no remnants of straw were visible next to the tile. This line was functioning quite satisfactorily except near the upper end where some years before surface water rapidly entering through a crevice in the ground had caused siltation of fine material for 100 feet downslope.

Samples of siltation material in tiles, acidity of material adjacent to the tile, and pieces of deteriorating tile were taken for analysis and study. A technical report prepared by SCS indicates, among other conclusions, that:

1. Remnants of the straw as placed about the tiles have lasted 10 years. Longer life would result if more straw were used. The straw prevented infiltration of fine material into the tile.
2. A slow deterioration of concrete tile takes place where the soil is more than mildly acid—pH 6.5. Many pieces of tile were softened

sufficiently that a dull jackknife would easily loosen and remove an eighth of the original tile surface.

3. Tile lines that are submerged for a long time accumulate an organic clinging scum growth around the entire inside surface of the tile. Scum an inch thick had developed in many cases. Poor outlet ditches and the low lying position next to salt water seem to be responsible for this condition.
4. Wood chips are an effective medium to encourage inflow into the lines. The chips should be coarse. Less deterioration of these chips is evident than in the straw. In some instances there was evidence that the chips had been forced away from directly over the tile during the backfilling operation. A narrower trenching machine and more generous use of the chips should correct this.

Among the interested farmers was Birger Johnson, who said, "Sure, I know the lines are full of water too much of the time. We certainly do need a drainage pump over near Edison."

Farmers plan to install the pump in 1959. This will make more effective use of the drainage tiles on Johnson's farm as well as those of his neighbors.



Silt and sand in a 6-inch tile on the Knutzen farm, 11 years after installation.



# Tree Farming In Ashley County

*A Soil Conservation District Supervisor Tells How His District Made Better Use of Land and Converted from an Economy of Forest Liquidation to an Economy of Tree Farming.*

By BOB PUGH

THE nationwide soil conservation district program is based on a philosophy of teamwork and cooperation. The boards of supervisors of these districts call on individuals, business firms, civic groups, local industries, and numerous state and Federal agencies for assistance in getting the big job of conservation done, whether it be in woodlands, pastures, croplands, or wildlife areas.

The Ashley County Soil Conservation District in southeast Arkansas is, in many respects, typical of numerous other districts throughout the country. The main emphasis has been and should be on cropland, where soil erosion is most active. However, 61 percent of the land of Ashley County is in woods. In fact, the timber industry is the life blood of the district's

economy. The tree crop, and certainly trees are a crop, could not be ignored.

The small woodland owners of the district have seen first hand, over a period of 30 years, the development of the forestry program of the district's largest industry, a company that operates a sawmill, chemical plant, and pulp and papermills and has a progressive forestry program. It was supposed to have closed its doors in the 1920's for lack of timber, but is now bigger than ever as a result of its foresighted program of resource management.

Trees have become a cash crop and woodland owners have recognized this fact. They are now interested in doing something about their own woodlands.

The records of the Ashley County Soil Conservation District show the increasing interest of district cooperators in the woodland phase

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Note:—The author is a farmer and chairman of the board of supervisors, Ashley County Soil Conservation District, Hamburg, Ark.



Three-year-old pine plantation in Ashley County.



of the conservation program. In 1951, when the district was organized, there was practically no tree planting in the county. In 1955, a total of 560,000 seedlings were planted on small ownerships. During these same comparative years, timber stand improvement increased from practically nothing to 690 acres; woodland thinning increased from practically nothing to 469 acres; harvest cutting from practically nothing to 2,636 acres.

The records for the first 6 months in 1956 show an even greater increase. During the first 6 months of 1956, twice as much was accomplished as in the entire year of 1955—623,000 pine seedlings planted, 1,208 acres of timber-stand improvement, 739 acres of woodland thinning, and 1,294 acres of harvest cutting.

An urgent conservation need in the Ashley County district is to return to production about 65,000 acres of abandoned farmland and other idle acres.

Trees are the answer for much of the idle land, and in 1952 the district supervisors took definite action to get the job done. The largest lumber company of the county was the logical one to approach for advice and counsel on this matter. After studying the matter, the company agreed to furnish 250,000 free pine seedlings to be distributed to small landowners. The landowners paid the cost of planting the seedlings. After seeing that a planting machine was needed, the large lumber company lent a tree planter to those landowners who wanted to use it.

Dry weather during that planting season created another problem. Tree planting was delayed and the supervisors thought that one tree planter was not enough to get the trees planted during the reduced planting season. So, determined to get the job done, they contacted 20 men in the district and told them about the problem. The result was that each of these men agreed to lend \$15 to the district to be used for the purchase of another planter. This money was to be paid back from the earnings obtained by charging the landowners 50¢ per thousand seedlings for use of the machine. The planting machine was paid for in a very short time.

The tree planting program has never lacked for participants. In fact, the number planted has increased each year and now the limiting



Low-grade hardwoods girdled and underplanted with pines 10 by 10 feet. A few hardwoods were left as seed trees.

factor is the availability of tree seedlings.

The district supervisors conducted a conservation tour in 1952. The purpose was to acquaint farmers and other landowners with the conservation problems in the district and to show these people some of the work that was being done through the soil conservation district program. On this tour, drainage, irrigation, pasture establishment, and woodland conservation were observed. One stop was made to see the district-owned tree planter on the Houston Chapman tree plantation. Another stop was at the Harry Allison farm to see a demonstration of the woodland phase of a conservation plan in action.

Mr. Allison explained to the group how he marked his timber for thinning, using the "D + 6" spacing guide. He also showed where he harvested crop trees to create openings for reproduction and girdled weed trees to release desirable species. Mr. Allison owns 120 acres of woodland and is managing it on a 5-year cutting cycle. His land is divided into 5 fields of approximately 24 acres each. Annual income is provided by cutting one field each year.

At present, more than 100 farmers are carrying out woodland conservation practices in cooperation with the district. Tours such as this proved helpful in creating interest in the conservation program.





Planting pine seedlings with a tree-planting machine in Ashley County.

Sound technical guidance from competent and experienced technicians is a necessary part of the soil conservation district program. The district supervisors are responsible for securing this technical assistance from either private or public groups. One of the principal sources of such help is the Soil Conservation Service which is responsible for helping farmers develop complete farm or ranch conservation plans that include the safe and most profitable use of all their land.

In helping the farmer or rancher develop his conservation plan, SCS technicians use land capability information to point out the best use of each piece of land including that suited for woodland. They show landowners that there are many things they can do to improve their woods and tell them where they can get technical help on the more complex jobs from consulting foresters, the state forestry agency, and industry foresters. Once interest in woodland is developed and the landowner recognizes the moneymaking possibilities of trees, he may get further help from a number of sources.

The Ashley County district gets much of its technical assistance in the management of the small woodlots from the large lumber company of the county. Company foresters are available to advise the owners on the proper management of their woodlots. When marking is

needed, trained technicians will do the marking with no obligation to the landowner.

The forest products industry realizes its opportunity to assist small landowners to grow bigger and better wood crops. The pulp and paper industry has been especially active in providing technical forestry assistance. This industrial association and most of its members employ conservation foresters who devote all of their time to this work. In Ashley County such assistance has been available from an international paper company as well as the large lumber company of the county.

Much has been accomplished over the past 25 years in American forestry in converting from the old economy of forest liquidation to the new economy of tree farming. We all have a definite stake in our country's timber resources. The Ashley County Soil Conservation District is proud of the progress it has made on its woodland program. Most important, it has all been made through the democratic processes of education, field trials, demonstration, and cooperation.

## BUFFALO RANCH

By VELMA NIEBERDING

ONE of the big attractions for tourists on Highway 66, north of Afton, Okla., is Russell Kay's "Buffalo Ranch." Travelers and local residents never seem to tire of watching the huge, shaggy animals grazing in neatly fenced pens adjacent to the buildings that house the attractions of the tourist center.

Mr. Kay has 180 acres of pasture where his buffaloes roam when they are not being photographed or admired by visitors at the ranch. Recently, in cooperation with the Ottawa County Soil Conservation District, he began a "conversion" program to transfer his land once used for farming, into a suitable feeding range for the buffalo. A small herd of Texas long-horns and a few "cattalo" (half-buffalo and half-cattle) will share the new grazing range.

"We chose bermudagrass as the ideal grass to reestablish the pastures that had been under cultivation," Kay explained, "because it is fast-

Note:—The author is a feature writer, Miami, Okla.



Pasture sodding with bermudagrass on Buffalo Ranch.

growing and will withstand the rough treatment the buffalo will give it."

Commenting on the "cattalo" Kay said that while these hybrids of the animal world were said to inherit superior qualities from both parents, they have not proved practical for commercial breeding. But as tourist attractions they are superb.

In the early days of Oklahoma, the buffalo grazed on bluestem, grama, and other native grasses; when he wanted a delicacy he browsed on shrubs and bark. But today's American Bison, completely assimilated into a "white culture" civilization and protected by conservation laws, must now depend on conservation programs to keep him supplied with nutritious and plentiful pasture.

A large buffalo bull may reach 11 feet in length and stand 6 feet at the shoulder. The



Buffalo grazing bermudagrass on Russell Kay's ranch near Afton, Okla.

reddish-yellow colored calves look more like Guernsey cattle than buffalo. However, as the animal grows older the color changes to a more uniform and darker color, particularly in the female.

Kay emphasized that the "buffalo burgers," which are a speciality of the ranch kitchen, are not made from any animals seen grazing about the premises.

"We import all of the meat," he said, adding that the buffalo burgers are a popular item on the menu.

So the buffalo on the Kay acres, gentled by domesticity, yet fierce enough to repel too-enthusiastic camera addicts, spends his days in protection without any of the problems faced by his ancestors of the western plains.

It is only when the huge animals lift their muzzles to scent the spring breezes, or peer with near-sighted wicked little eyes across the prairie that the visitor to the ranch feels a little sad. Despite the lush bermuda, one imagines the buffalo would rather be roaming than restrained; that he would prefer a buffalo wallow to insecticide sprays; that he listens nostalgically for the thunder of buffalo feet that will never come.

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**EARLY EXPLOITATION.**—"We ruin the lands that are already cleared and either cut down more wood, if we have it, or emigrate into the western country—yet such is the force of habit that we cannot depart from it."

GEORGE WASHINGTON



# GOPHER GETTERS

By CHARLES G. VAN GORDER

THE Camp Verde and Verde-Oak Creek Soil Conservation Districts, in central Arizona, sponsored a "Get-Out-The-Gopher" contest to arouse more interest in the control of pocket gophers on irrigated farmlands.

Gophers tunnel in the ground and eat the roots and crowns of plants. They damage many crops such as alfalfa, vegetables, and fruit trees. Even greater damage results from the loss of water and soil on irrigated lands. Burrows in the banks of ditches and canals may lead to breaks in the earthwork through which water is lost and adjacent lands are flooded, making expensive repairs necessary.

When an irrigated field lies adjacent to a cut bank, arroyo, or riverbank there is always danger from the presence of gophers. Water escaping to a lower level through a gopher hole may cause serious damage. Besides wasting water, it can result in the formation of a big gully and loss of part of the field.

Working together as a team, the two soil conservation districts, the University of Arizona, the Extension Service, the Fish and Wildlife Service, the Soil Conservation Service, and

Note:—The author is work unit conservationist, Soil Conservation Service, Cottonwood, Ariz.



County Agents Alvin Allen points to a hole in a crumbling bank caused by a pocket gopher, while Frank Gyberg, SCD supervisor holds the trapped gopher that caused the damage.

the public schools have shown what can be accomplished by cooperation in a very worthwhile project in the Verde Valley.

The contest was a huge success in many ways. By actual count, 1,485 gopher tails were turned in by 19 boys and girls who competed in the 2-month long contest.



Champion gopher-getter Nancy Bates, who contributed 232 of the 1,485 gopher tails on the table in front of her.

To start things off a planning meeting was held in the fall of 1958 at Camp Verde to explore ways of arousing more interest and action in controlling gophers. Attending this meeting were several key farmers and ranchers, soil conservation district supervisors, the county agent, and representatives of the Fish and Wildlife Service and the Soil Conservation Service.

After discussing how to get people interested in doing something about gopher control the idea of a contest seemed to be the logical answer. The Yavapai County Agent Alvin Allen helped organize and conduct the contest.

The two soil conservation districts agreed to put up the prize money of \$100 to be given as follows: \$25 as first prize, \$15 as second prize, and \$10 as third prize. Then in order to encourage more boys and girls to enter the contest the district supervisors set up 10 prizes of \$5 each. And at the termination of the contest they added six more prizes of \$2.50 each so

every boy and girl who participated in the contest would receive a prize.

The biggest task was that of informing all school children about the contest. This job was done by the county agent and Walter Walker of the Fish and Wildlife Service. Short programs were held at the Cornville, Camp Verde, and Cottonwood Elementary Schools and at Mingus Union High School in Clarkdale.

Then in order to arouse still more interest these men met with the various civic clubs in Camp Verde, Clarkdale, and Cottonwood communities. The local newspaper, *The Verde Independent*, carried numerous spot stories about the contest from time to time during the 2-month period. The radio station KCLS, which covers the valley, announced the leading gopher catcher each week. During this time two field-day demonstrations were held to acquaint the public on how to trap gophers.

In order to be eligible for a prize each boy or girl contestant had to turn in a minimum of 10 gopher tails to the school custodian, who kept the official count.

Champion gopher-getter was 9 year old Nancy Bates of Cottonwood, who trapped 232 and won first prize money. Close behind was Mary Davidson of Camp Verde who turned in 226 tails. Third prize was won by Bernard Edge of Camp Verde with 190 tails to his credit.

One Saturday morning early in February the winners were presented their awards by Chairman Ben Wilson of the Camp Verde Soil Conservation District.

When one considers the destructive damage gophers cause to fields, irrigation ditches, fruit trees, gardens, and crops it is terrific. The trapping of nearly 1,500 gophers has destroyed a potential several thousand other gophers. Trapping 20 to 25 gophers per acre is not uncommon in the Verde Valley. It is a job that must be carried out all the time because the gophers migrate to and from adjacent areas.

Gopher control work is an important soil and water conservation job on farms, ranches, and small acreages. A real conservationist must keep the gophers under control at all times.

This contest was so successful that the boys and girls want to have another one real soon. The idea is even catching on in other soil conservation districts. This project may become an annual affair in the Verde Valley.



**GROUND WATER HYDROLOGY** By David Keith Todd. 336 pp. Illus. 1959. New York: John Wiley & Sons, Inc. \$10.75.

**I**N the "Preface" the author states that his purpose in writing the book is to present the fundamentals of ground water hydrology in a manner understandable to those most concerned with such knowledge. The book fills a much needed requirement in this respect. The author further states that the book is written primarily for use of civil engineers, geologists, and agricultural and irrigation engineers. Consequently, complete understanding of the fundamentals as presented in the book, requires a background in calculus and elementary geology.

The author has presented a minimum of original data, drawing profusely from published works. A list of references at the end of each chapter itemizes the more important literature related to the subject matter of the chapter.

The subject matter of the book is well organized. It contains 14 chapters dealing with fundamentals of ground water occurrence, movement and hydraulics; development of deep and shallow water wells; ground water quality and fluctuations; basin-wide ground water development; surface and subsurface investigations; methods of artificial recharge; salt water intrusion in coastal areas; legal aspects of ground water; model studies; and numerical analysis of ground water. The book contains many useful graphs, tables, and illustrations.

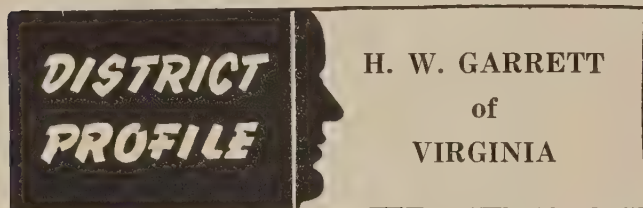
The book, in general, summarizes and brings up to date, basic information related to the subject of ground water and problems of development, use, and conservation. In this respect it is particularly valuable as a text book for college students, as a reference guide to ground water research specialists, and as a practical handbook for engineers and geologists.

—L. C. GOTTSCHALK

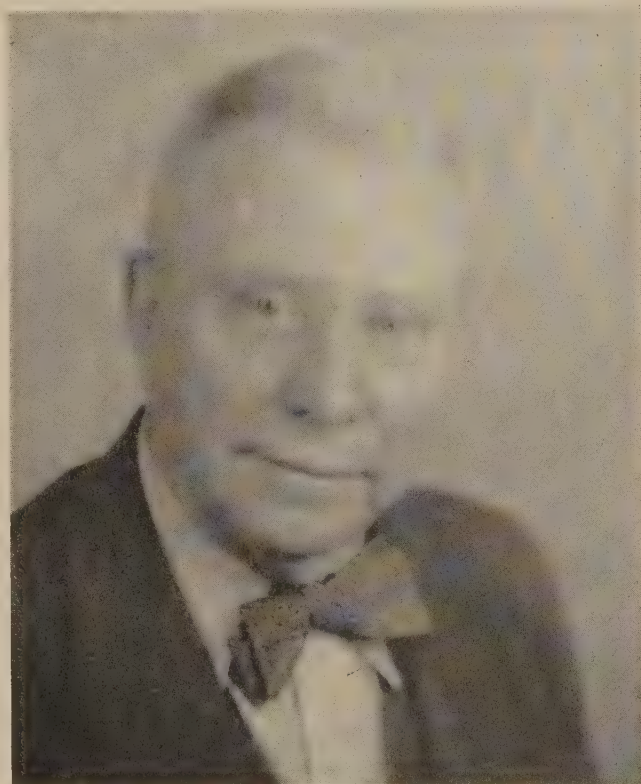
**WORLD RECORD COTTON CROP.**—The Foreign Agricultural Service estimates that the 1958-59 world cotton crop will be about 44.7 million bales, the highest on record. The previous record crop was about 43.5 million bales, in 1955-56.



CHANGE OF ADDRESS SHOULD INCLUDE ZONE, OLD ADDRESS, AND CODE NUMBER



organizations. He was charter member and first chairman of the Mathews County Ruritan Club. He also helped organize the Northumberland County Ruritan Club after moving to the Northern Neck and served as first chairman.



H. W. Garrett

"CONSERVATION has become a part of me," said Mr. H. W. Garrett, who has been active in soil and water conservation for almost 20 years. Mr. Garrett became a supervisor in the Northern Neck district in 1940. He has continued on the board since then, and is its chairman at present.

"Shorty," as he is better known, was born at Green Bay, Va. and was reared on a tobacco farm. He attended Hampden-Sydney College and was graduated with a B. A. degree in 3 years. He also holds an M. S. degree in Agricultural Education from Virginia Polytechnic Institute.

He moved to Northern Neck in 1937. In 1940 he became a member of the board of supervisors in the newly formed Northern Neck Soil Conservation District.

"I have always been deeply interested in the conservation of our natural resources, but was a bit surprised when elected as a director of the State Association of Soil Conservation Districts during my first year as supervisor," said Mr. Garrett. He served as chairman of the nominating committee of the State association for 15 years and was also on the legislative committee. He served as vice-chairman for 1 year in the State association, of which he is a charter member, and has attended all meetings.

Mr. Garrett taught vocational agriculture from 1919 until 1957. Besides this and conservation work, he has been active in many other

He is past governor of the Chesapeake District of Ruritan National. He also served as chairman of the county Red Cross, War Fund drive, and bond sales. He is a member of the Virginia Academy of Science.

Mr. Garrett is married to the former Anne Marion Webb, of Richmond, Va. They have one son, H. W., Jr., and one granddaughter.

—W. A. PHILLIPS



An aerial photograph showing a terraced hillside. A winding road or path curves through the terraces. A large, dark, forested area is visible on the left side of the image. The terraces are arranged in a grid-like pattern, with some areas showing more pronounced erosion control features.

**OCTOBER 1959**

# **Soil Conservation**

Soil Conservation Service • U. S. Department of Agriculture



# SOIL CONSERVATION.

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TOM DALE, Editor

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“THE noblest task that confronts us all today is to leave this country unspotted in honor, and unexhausted in resources. I conceive this task to partake of the highest spirit of patriotism.”

On our nation's birthday we might well reflect on these words of Gifford Pinchot written a half century ago. Yet it was only 25 years ago that our country first awakened to the task of keeping our resources from becoming exhausted.

Today we are working to save our soil. In Wisconsin where soil conservation had its beginning, the work moves ahead. There's still more to be done, but the record to date is impressive.

The battle against erosion will continue because our country and its soil are sacred.

People will fight to keep the land green and fertile just as a soldier will fight to keep it free.

—Excerpted from front page editorial in WISCONSIN AGRICULTURAL-IST of July 4, 1959.



FRONT COVER.—A section of a 420-acre citrus grove, said to be the world's largest grove planted on the contour, in Lake County Soil Conservation District, Florida.

Photo by Elmer Turnage

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# Lynn Gulch Has Fewer Gulches

## John McBrearty Has 4.5 More Acres, Checks Erosion, and Saves Time and Labor

By NORMAN DONALDSON

**J**OHN MCBREARTY has reclaimed 4.5 acres for pasture and hay and, at the same time, eliminated a severe erosion problem on his land in the Lynn Gulch area north of Pomeroy, Wash.

The 200-acre field with a 25 percent slope had for many years been cut by gullies, some as deep as 10 feet and equally as wide.

Each spring has seen many tons of topsoil washed into and down the gulches. In the spring of 1953, McBrearty, teaming up with the Pomeroy Soil Conservation District and with engineering supplied by the Soil Conservation Service through the local district, set out to do something about the problem.

The SCS technician and McBrearty examined the gullies. McBrearty realized he must follow recommendations exactly if he wanted to be successful in stabilizing the gullies.

A soil survey of the farm indicated that the soil was a deep Walla Walla silt loam. Such soils have a high silt and low clay content. They do not compact readily.

The technician advised McBrearty to use a sheepsfoot roller after each 6-inch layer of fill. This roller was to be one of the keys to success as it packs the soil tighter than the original soil. No stubble brush, or other debris would be used in filling. It was recommended that after the gullies were filled, they should be graded, shaped, and seeded to grass to serve as waterways. A diversion ditch was to be placed at the top of the waterways to divert any sudden runoff from cloudburst or snow melt.

McBrearty hired a bulldozer and operator and rented a sheepsfoot roller from the Pomeroy Soil Conservation District, using his own

tractor to pull the roller. Each gully was filled and packed. First, the gully was shaped with the bulldozer so it could be filled in 6-inch layers and packed. This process of filling and packing continued until each gully was filled.

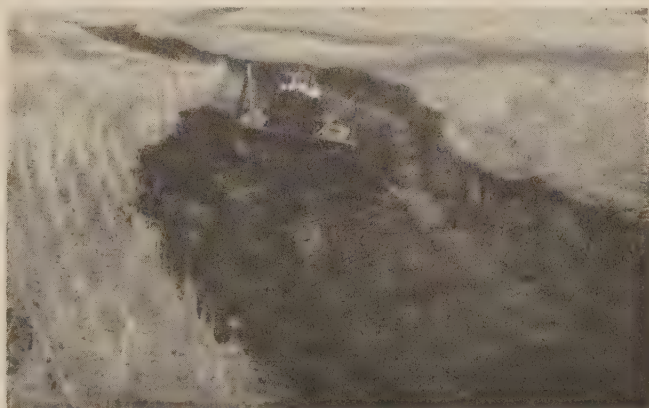
After the gullies had been filled they were graded and shaped. Diversion ditches were built above them as recommended. Then a seed-bed was prepared and the waterways were seeded at the rate of 10 pounds to the acre of intermediate wheatgrass. By fall a good cover of grass was established. The waterways came through the winter and spring without being severely damaged.

What McBrearty has gained is a slope uninterrupted by deep gullies. He now can operate at right angles to the slope instead of up and down, as he was forced to do in the past. He not only has eliminated gullies, but also is controlling erosion on the entire field.

His project also has gained several acres of pasture or hay land. The gullies had been a big hazard in his cattle operation. Young and old animals alike had fallen into the gullies to die of broken bones or starvation before being discovered.

In 1958, McBrearty was selected as "Soil Conservation Farmer" for Garfield County. The award was based on the waterway project and the fact that he is continuing to be a conservation farmer.

Bulldozer shapes a gully on the John McBrearty farm. Next steps are to pack and seed it as a waterway.



Note:—The author is soil scientist, Soil Conservation Service, Pomeroy, Wash.





# Scientist Makes Water His Servant

by JACK BARRICK

**S**TOP water at its source, use it and reuse it. Then release it slowly to avoid soil erosion. That's a profitable practice as you can learn from Dr. Joseph George Davidson, internationally famous organic chemist, owner of 9,000 acres on picturesque Mount Equinox, high above Manchester, Vt.

Clear, cool water from mountain rivulets and springs on Mount Equinox follows a winding course before it reaches the valley below. Dr. Davidson puts it to work on its way down the rugged slopes.

Hydroelectricity, water supply, sediment reduction, flood prevention, and preservation of the natural beauty of the majestic mountain are Dr. Davidson's objectives.

Dr. Davidson, president of the Connecticut River Watershed Council and former vice president of a large company, has led a busy life. A long list of corporate responsibilities and unusual creative works in the field of vinyl plastics have distinguished the energetic scientist.

Dr. and Mrs. Davidson first saw Mount Equinox on a Vermont tour in 1939. They were seeking a place to develop their project. The quiet and serenity of the Vermont countryside appealed to them.

The Davidsons bought 2,000 acres on the mountain that year. They added 7,000 acres of

the mountainside to their holdings after it appeared certain that all of their expectations could be fulfilled.

Now, 20 years later, the Davidsons have everything as they had planned. Even their inn, unique for its plastic walls, ceiling, and furnishings, rests at the top of the lofty peak, 3,800 feet above sea level. Dr. Davidson's earlier mental picture became a reality in Barbo's Lake and Lake Madeleine in 1957.

The manmade lakes, cradled on the steep slopes, store water for generating electricity with Pelton wheel turbines housed farther down the mountain. Heavy runoff from melting snow loses its destructive energy upon flowing into the lakes. It accumulates in the basins for later release through a steel pipeline, called a penstock, down the mountain to the generators.

Lake Madeleine, largest of the reservoirs, is a high point in Dr. Davidson's long-range plans. It has a storage capacity of 200 million gallons of water. Two earthen dams, built across either end of what had been a swampy divide, form the 35 acre lake. At spillway level the water is 70 feet deep.

Lake Madeleine, named for Mrs. Davidson, is 2,200 feet above sea level. It stores water during spring thaws and at times of flash floods. Dr. Davidson wanted to impound water at the highest practicable point. He has also provided a way to pump water back up the penstock to Lake Madeleine from another reservoir—called Hopper Pond. Back pumping will be done only when the water level in Lake Madeleine is below

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At top is pictured Sky Line Drive on Mount Equinox. Lakes Madeleine and Barbo are in left center.

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Note:—The author is State soil conservationist, Soil Conservation Service, Burlington, Vt.



normal, when there is a surplus outflow from Hopper Pond, and when the need for electricity is low.

Dr. Davidson explained that this system utilizes surplus electricity during slack loads to store water for use during peak loads.

Dr. Davidson uses much of the water twice for generating electricity. Water from Lake Madeleine drops 400 feet through a penstock reaching a Pelton wheel at a powerhouse with 180 pounds pressure. Turbine outflow from that wheel flows into Hopper Pond before making a second drop of 750 feet to a Pelton wheel in another powerhouse with 290 pounds pressure. That same water helps regulate streamflow beyond his property line.

The system is automatic. A needle valve regulates the quantity of water surging from penstock against cups of the Pelton wheel. The valve opens wider as electrical load increases, sending additional water to maintain the generator at constant speed. The valve opening lessens when the electrical load decreases.

Doctor Davidson provides the Civil Aeronautics Administration with electric power to operate communication towers at the summit of Mount Equinox. Thousands of tourists seek thrills and scenic views in driving up Equinox Sky Line Drive, a 6½-mile climb on a paved highway that he engineered and built.

Lake Madeleine is in effect a flood prevention reservoir, too. It traps runoff from a 1,300 acre watershed for release later through the penstock. Water is deepest following spring thaws. Water rose within 4 feet of the principal spill-

way last spring. Its lowest level follows the late summer and fall tourist season when much electricity is used to heat the inn and other buildings on the mountain. The doctor doesn't expect outflow through the emergency spillway often.

Barbo's Lake, second in size, covers 8 acres. It has a fairly uniform depth of 10 feet. Its discharge supplements smaller Hopper Pond when additional water is needed to spin turbines in the lower powerhouse.

Soil-holding sod protects the earthen dams. Deer, in two's and three's, feed on the lush grass that surrounds the lakes. Rip-rap prevents shore erosion.

Doctor Davidson said that trees best protect the steep watersheds above his lakes from soil erosion. He doesn't plan to cut them soon. He's content to have the dense foliage and deep, intertwining roots to hold his mountain soil securely. His long-range plans include cutting mature trees on a selective basis.

While Dr. and Mrs. Davidson first sought only a place in the country to work at their project and later expanded far beyond their original intentions, they continue to find serious challenges on the mountain.

Doctor Davidson is frank to admit that his intense interest in developing soil and water resources on Mount Equinox has carried him too far to quit now. But he is quick to add that he and Mrs. Davidson love it and they are looking forward to many more years at developing soil and water resources on Mount Equinox, using modern techniques.

Lake Madeleine, half full when this picture was taken, drops water 400 feet to turbine.



The inn on summit of Mount Equinox at end of the drive with CAA towers at left.





# WATER IN THE SOUTHWEST

Research seeks answer to when, how much, where it goes, what for, and why.

By R. V. KEPPEL and J. E. FLETCHER

Approximately half a million square miles in the Southwestern United States are in the arid and semiarid climatic zones. The principal use of this vast area is for livestock grazing.

Water yields from the area are generally low and constitute only a small portion of the water supplies for irrigation. On the other hand, a major part of the sediment entering irrigation reservoirs comes from rangeland. During recent years municipal, industrial, and irrigation users have made increasing demands on the limited water resources of the Southwest.

Downstream water users fear that vegetative improvement on rangelands as a result of soil conservation programs may reduce the already pitifully small water yields of these areas. Ranchers operating the land quite naturally are interested in maximum forage production. They feel that any rain falling on the land is theirs to use to their best advantage.

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Note:—The authors are respectively agricultural engineer and soil conservationist, soil and water conservation research division, Agricultural Research Service, Tuscon, Ariz.

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Pictures, starting at upper left: Black grama and associated grasses on Walnut Gulch experimental watershed . . . much of this brushland was in grass 60 years ago . . . Alamogordo Creek experimental watershed with juniper invading valley floor . . . one of new runoff measuring flumes in Walnut Gulch watershed.





In an effort to provide basic hydrologic data necessary for the intelligent management of these rangelands, the Agricultural Research Service, in cooperation with the Soil Conservation Service and the State agricultural experiment stations, is conducting watershed research in Arizona and New Mexico. The studies were begun by the research division of the SCS in 1953 and have been continued by the ARS since 1954.

Some of the questions which the research studies are designed to answer are:

(1) What are the important runoff-producing characteristics of convectional thundershowers?

(2) How much water and sediment are yielded from range watersheds of various sizes under present vegetation and management? (3) How will a range conservation program affect these yields? (4) How much of the runoff water does the channel system lose before water reaches a point of downstream use, and what happens to it?

Two large watersheds have been selected for intensive field study: Walnut Gulch watershed at Tombstone, Ariz., and Alamogordo Creek watershed near Santa Rosa, N. Mex.

The Walnut Gulch watershed includes 60 square miles. In addition to the main watershed, four subwatersheds ranging in size from 0.9 to 43 square miles are gaged. Vegetation is representative of the black gramagrass areas of southern Arizona which have been partially invaded by mixed stands of creosotebush, whitehorn, and tarbush. Comprehensive surveys of soil, vegetation, and range site and condition are essentially complete.

In eastern New Mexico the 67 square mile Alamogordo Creek watershed was selected as representative of the blue gramagrass areas. Vegetation on the level portions of the valley floor consists of blue grama, galleta, and their associates. On the escarpment which rings the valley are found stands of pinon and juniper, which have moved out into the rougher portions of the valley. One measuring flume at the watershed outlet is in operation. Soil and range site and condition surveys are well on their way to completion and detailed sampling of the vegetation is in progress.

One of the unusual features of the hydrology of semiarid lands is the very small area covered

by runoff-producing rains. Practically all of the runoff from the watersheds comes in the convectional thundershower season. Recent studies of radar film records indicate that in southern Arizona the average summer thunderstorm diameter is about 1 mile. Several of these small storms may occur more or less simultaneously on one of the large watersheds. Rainfall intensities are typically very high. It is obvious that in order to obtain an accurate picture of the rainfall pattern on a 60 square mile area, a large number of recording rain-gages are needed. At present time the Walnut Gulch and Alamogordo Creek watersheds have about one gage per square mile. Data from these dense gage networks are yielding important information concerning depth-area-frequency relationships for the unique storm types characteristic of the region.

A distinctive feature of the runoff pattern, which results from the peculiar nature of the runoff-producing storms, is the large channel or transmission loss. Runoff from one or more small thunderstorms on one portion of the watershed may flow through an extensive network of dry channels before reaching the watershed outlet. A significant portion of the runoff water may be absorbed by the coarse textured channel deposits during the flow. Losses as high as 5 acre-feet per mile of channel during a single flow have been estimated on the Walnut Gulch watershed. Whether or not the water lost in the channels ever reaches the permanent ground water table depends on the geology of the area. Preliminary estimates indicate that much of this water is used by the shrubs and trees which flourish along the edge of the channels.

Major problems have been encountered in obtaining accurate flow measurements from the large experimental watersheds. Although the

## No. 50

This is the fiftieth of a series of articles to appear from time to time in explanation of the various phases of research being conducted by the Department of Agriculture on problems of soil and water conservation.



channels may be dry as much as 99 percent of the time, the runoff that occurs comes as extremely flashy flows. Flow rates commonly rise from zero to several thousand cubic feet per second in 15 or 20 minutes and recede again to zero in 2 or 3 hours. Steep channel gradients, high velocities and heavy concentrations of sediment further complicate the measurement problem. Based on extensive model testing and on early field experience, new measuring flumes have been developed and are being built in order to overcome such difficulties.

Each of the experimental watersheds has 25 to 30 stock watering ponds. Periodic surveys of these ponds will yield information on sediment inflow rates. In addition, water level recorders are being installed on several of the ponds to measure runoff from small areas of various combinations of soil and vegetation. Where bank erosion is a major source of sediment, periodic channel surveys are made.

Runoff and sediment production are being measured from the watersheds under present conditions of vegetation and management. Meanwhile, cooperative studies with individual ranchers on the watersheds are pointing the way toward economic and effective measures for improvements. The relationships that exist between kinds and amounts of native vegetation present and various soil, climatic, and management factors are being studied in order to shed more light on runoff and sediment

problems. When an initial period of calibration has been completed, a concerted effort will be made to apply a comprehensive soil conservation program on the ranches comprising the watersheds, and the effect of this program on water and sediment yields will be evaluated.

In addition to the large watersheds on which water and sediment yield are being studied, seven smaller rangeland watersheds have been under measurement for nearly 20 years. Three are located near Albuquerque, N. Mex. and range from 40 to 180 acres. Four in the vicinity of Safford, Ariz. vary from 520 to 760 acres. Although the soil and vegetation inventories on these areas have not been as complete as on the large watersheds, basic rainfall and runoff data from them are producing valuable information for use in the design of stock ponds and for current flood prevention and upstream control programs. Methods have been devised for synthesizing hydrographs for small arid-land watersheds. The shape of the runoff hydrographs from these areas seems to depend only on certain physiographic features of the watershed. This makes it possible to predict the hydrograph shape for similar ungaged watersheds by evaluating these physiographic features from aerial photos and maps or from reconnaissance surveys. Studies are continuing on the effect of soil, vegetation, and preceding rainfall and runoff on the rainfall-runoff relationship.



Small exhibits such as this are appearing in windows, lobbies, and offices throughout the Great Plains to help focus attention on the Great Plains Conservation Program. USDA has sent 750 of the 29 by 45 inch, four-color portable exhibits to SCS offices in the 10-State region where the program is in effect.



# Mr. "Till" Had a Dream...

*It came true in the North Carolina Mountains where he keeps store, farms, and preaches conservation.*

By LEON J. SISK

**N**EARLY everyone has a secret dream. For some it's as heroic as one of Walter Mitty's daydreams. For thousands of people it's a simple dream. They'd just like to make enough money to quit their job, to buy a small place in the country, and retire.

For many that dream is never realized, but for M. O. "Till" McCall, district supervisor of the Transylvania Soil Conservation District, the dream came true.

McCall was employed by the Southern Railway for 25 years, until his retirement in 1927.

Note:—The author is information specialist, Soil Conservation Service, Spartanburg, S. C.

Soon after his retirement he moved to a farm in the mountains of Transylvania County, N. C., near Brevard. In doing so, he finally realized a dream that had remained with him for a quarter of a century after leaving the farm at age 17.

Today at 74 Mr. "Till," as he is affectionately addressed, is not physically able to farm as much as he once did. But he still farms some and operates a "country" store. His greatest pleasure, however, is serving as one of the supervisors of the Transylvania Soil Conservation District.

Mr. "Till" (right) converts customers to conservation on his country store porch.





Almost any time of the day he can be found seated in a cane bottomed chair on the porch of the store talking soil conservation to anyone who will stop and listen.

Mr. "Till" has some rather definite opinions about soil conservation and people who won't practice soil conservation, and he doesn't hesitate to express them. His "education" usually gets results.

One time though it took a heavy rain to "convert" a farmer who couldn't be persuaded to change his way of farming because he "remembered how his grandpa did it," as Mr. "Till" expressed it.

One day Mr. "Till" and his farmer-friend went to Brevard for some seed corn. On the way back with the seed, he relates, "We met my friend's fertilizer going to town in a swollen stream that was only half water. The other half was soil and last year's fertilizer."

"I pulled up on the bridge to call my friend's attention to this and give him a little friendly lecture. Just as we stopped, down the stream came an empty fertilizer sack that had washed

out of a field where my friend had put out fertilizer just the day before.

"He has been strip cropping ever since," Mr. "Till" added with a twinkle in his eyes.

Mr. "Till's" farming today is mostly patch farming—a little corn, a vegetable garden, and a pasture. He started in 1930 with 104 acres but with encroaching age that was too much to take care of so he sold all but 16 acres. At 74 he's not quite as active as he once was—physically, that is. Mentally, he's as alert as a young man and, like a young man, he has the vision to see the need for the widespread adoption of soil and water conservation in Transylvania County.

"Mr. 'Till' is still active enough to attend meetings," says Harry Newland, Soil Conservation Service technician assigned to help farmers in the Transylvania Soil Conservation District. He visits farms, walks over them with me, and preaches the gospel of soil and water conservation as the salvation of mountain farming in Transylvania County.

*He liked trees and profits so he started*

## Woodland Conservation

By MAX D. BOLAR

**D**ID you ever "have your cake and eat it?" Arl Hildebrand of Prescott, Ark. did. In 1940 he started a woodland conservation program on 8 acres of his farm on which a dense stand of pine trees was growing. Because of the density of the stand, the trees averaged 9 inches in diameter at breast height even though they were over 30 years old. The soil in his woodland field was classified as capability Class III, therefore, capable of being used for pasture or row crops provided certain crop rotations were used. Also, it has a high suitability for wood crops.

Clear cutting the woods was quite a tempta-

tion when he was offered \$300 for the timber. Where else could you get \$300 for a crop that just grew up by itself, with no extra care? On the other hand, Arl knew that once he had clear-cut he would have quite a long wait for another woods like it. He talked with technicians of the Soil Conservation Service about his land use and conservation problems. They suggested that he use this field to grow a wood crop. He could do this very simply by keeping the best trees well spaced and thinning out the poorest. This amounted to giving trees "space to grow, but none to waste." They told him that probably he could make more money in the long run by using this field to grow trees than he could by using it for other crops.

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Note:—The author is a woodland conservationist, Soil Conservation Service, Hope, Ark.

**Arl Hildebrand's income from tree farming.**

| Year  | Sawlogs |         | Pulpwood |       | Total Value |
|-------|---------|---------|----------|-------|-------------|
|       | Bd. Ft. | Value   | Cords    | Value |             |
| 1940  | 9,500   | \$104   | 54       | \$108 | \$212       |
| 1945  | 14,500  | 380     | 9        | 18    | 398         |
| 1950  | 3,500   | 135     | 6        | 18    | 153         |
| 1954  | 20,000  | 880     | 2        | 10    | 890         |
| 1957  | 19,600  | 910     | 4        | 20    | 930         |
| Total | 67,100  | \$2,409 | 75       | 174   | \$2,583     |

The 67,100 board feet of lumber cut from 8 acres means an average yield of more than 8,000 board feet per acre over the 17 year period. That is more than twice the amount he had when he started selective cutting. In addition, he harvested 75 cords of pulpwood. Moreover, he now has more standing timber than he had in 1940. He has received more than eight times as much money by selective cutting over the 17 year period as he would have received by clear cutting in 1940.

In addition to making money from his woods, Arl Hildebrand has developed into a good woodsman and is now a real tree farmer. Since the second cut he has marked his own woods and has done his own cutting, skidding, and



Part of Arl Hildebrand's 8 acres of timber that has produced more than \$2,500 in 17 years.

hauling. He maintains that farmers are missing a good profit by not doing their own woods work.

Not satisfied with the original 8 acres, Mr. Hildebrand has planted over 100,000 pine seedlings during the past 10 years. He proposes to commence thinning his pine trees when they reach pulp size, which they do when they are 10 to 11 years old.



Arl Hildebrand standing by one of the more than 100,000 pines he has planted.

### **Teamwork in Utah**

When the West Fork of Grouse Creek in Utah needed a reservoir to supplement its water supply, repair of a water diversion and an improved irrigation system, everyone pitched in. SCS could not provide immediately all the engineering help requested by the West Box Elder Soil Conservation District so farmers hired private engineers to complete plans and specifications. The Utah Water and Power Board gave an interest free loan to cover part of the construction cost. ACP cost-sharing program helped. Mutual irrigation companies and other groups aided in various ways.



By TOM EVANS

# Teamwork Sparks

The Green's Lake watershed area above Cedar City, Utah, doesn't flood very often, but when it does it lets loose with some real rip-snorters.

For years the watershed, covering an area of about 10 square miles, has been cocked, primed, and aimed directly at Cedar City. Most floods that rolled down from the watershed were troublesome and damaging, but not nearly as costly as the one which swept down the mountain on July 26, 1956.

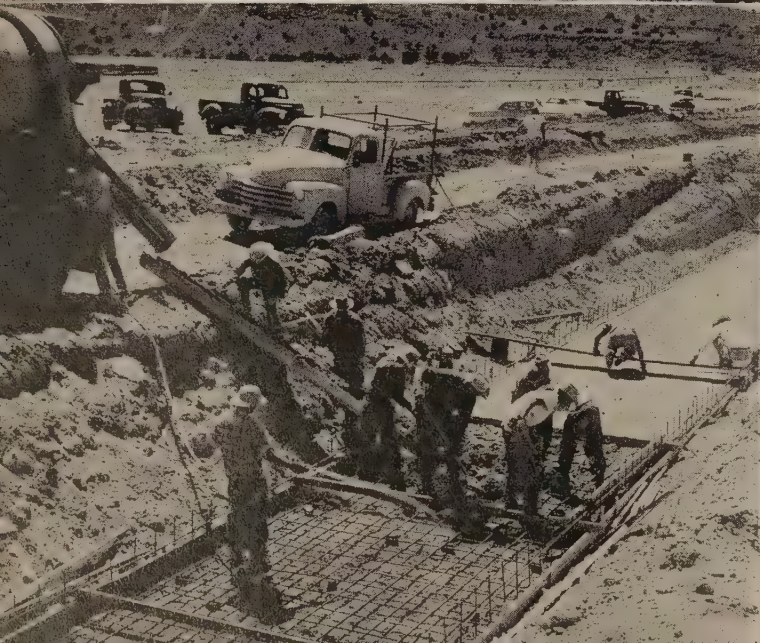
Like many American communities, Cedar City has been growing. Housing developments, streets, and public buildings have been built

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Note:—The author is area conservationist, Soil Conservation Service, Cedar City, Utah.

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Pictures, starting upper left: Clearing pinyon-juniper trees in preparation for reseeding in Green's Lake Watershed . . . employee of Cedar City seeds Siberian wheatgrass . . . SCS engineer surveys site for debris basin . . . construction of concrete channel to carry flood water involved 42,750 yards of excavation . . . completed concrete section of flood channel required 810 cubic yards of reinforced concrete . . . man looks down completed emergency spillway . . . at ground breaking ceremonies are (left to right) Claude Urie, local contracting officer, Warren Bullock, chairman of watershed committee, William Thorley, supervisor of Iron County Soil Conservation District, and Ron Phillips, contractor's representative.





# Watershed Project

on the flood plain and in the wide natural channel which used to let floods bypass the town with little damage. Damage to homes, streets, and farmland in the path of the 1956 flood was more than \$100,000.

When the big flood hit, Cedar City's mayor declared a state of emergency. Men over 21 and all available equipment were pressed into service. For several days as storm clouds gathered over Green's Lake several smaller, damaging floods followed the devastating wake of the large one.

After the floods, local people took up the heartbreaking job of cleaning muck out of basements and salvaging rugs, furniture, furnaces, and electric household equipment. Streets and sidewalks had to be repaired, retaining walls replaced, basements pumped out, and plugged sewers cleaned out.

Once the cleanup job was done, the main thought in everyone's mind was, what would prevent the same thing from happening next week, next year, or 2 years hence? The mayor met with the City Council. Supervisors of the Iron County Soil Conservation District also gathered to discuss the problem. These meetings resulted in the organizations jointly sponsoring an application to the Soil Conservation

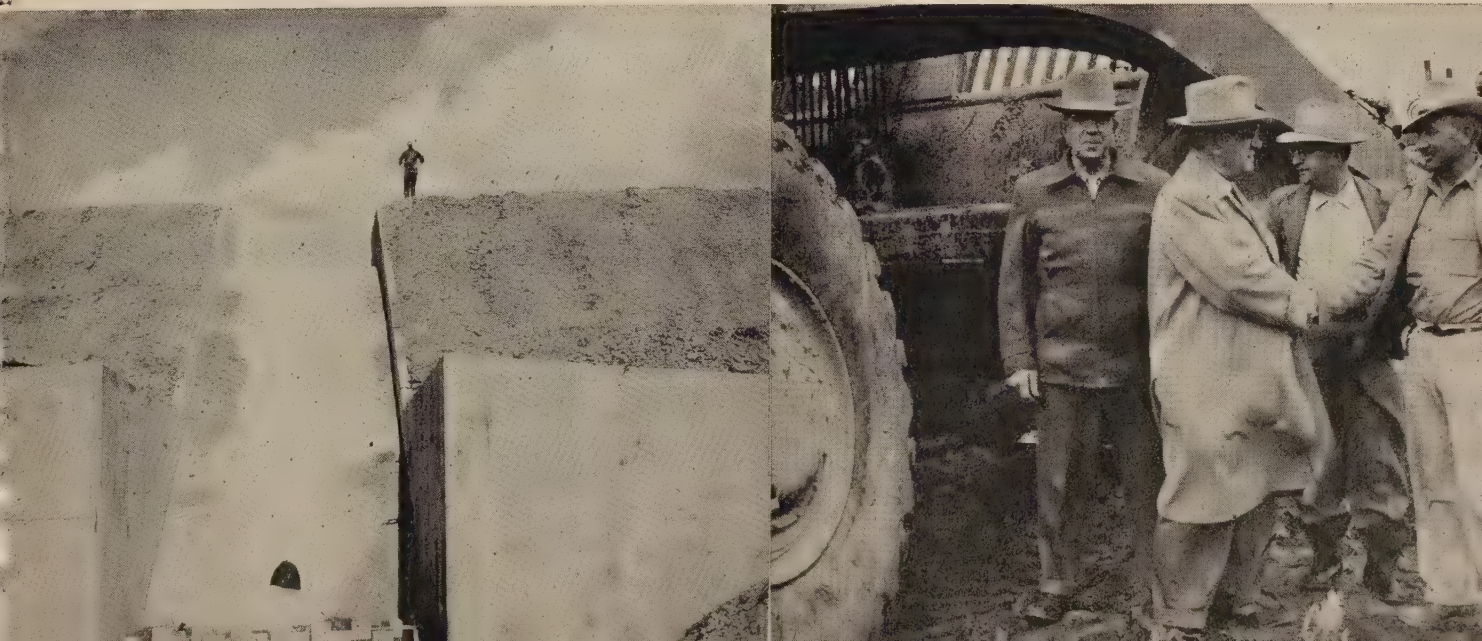
Service and the State of Utah for a watershed protection and flood prevention project for the Green's Lake watershed.

The application was approved and the Soil Conservation Service commenced development of a work plan on January 22, 1957. Numerous obstacles appeared, many of which could only be overcome by action of the local people.

A watershed committee formed of representatives of the people, met often to tackle problems as they developed. Under the able chairmanship of Warren Bulloch and with the wholehearted cooperation of everyone concerned, the committee worked out each tough problem.

Here's what teamwork did for Cedar City: When test pits were needed, Cedar City hired a backhoe and furnished rodmen for preliminary surveys; Iron County Commissioners agreed to relocate a county road in a few places and the State Highway Department agreed to a floodway under U. S. Highway 91. One rancher agreed not to use that portion of his range for a period of 5 years. Another rancher moved his sheep herd off the watershed to another range which Cedar City leased for him. Other examples of local cooperation were numerous.

Just 2 months after planning commenced, the work was approved by the Governor and





sent to the Administrator of the Soil Conservation Service.

On April 22, 1957, the watershed project was approved and installation of the various works of improvement was under way.

The work plan called for installation of both land treatment and structural measures. Land treatment consisted of proper range use, clearing of brush and pinyon-juniper trees followed by drilling grass seed, airplane seeding of the entire watershed, and fencing. Much of this work was done during the summer and fall of 1957. ACP participated in cost-sharing on clearing, seeding, and fencing done by the ranchers. The Bureau of Land Management helped plan the land treatment measures on lands administered by them and have moved ahead rapidly with the land treatment measures.

For the structural works of improvement, additional surveys were needed and detailed designs had to be prepared. SCS personnel in Cedar City and the design section of the regional engineering and watershed planning unit worked hard and long to get these jobs done. The contracting local organization sent out preinvitation-to-bid letters to 135 contractors on December 16, 1957. Fifteen bids were received, and the contract was awarded to a contractor of Price, Utah, on January 28, 1958 for \$181,606.

Structural measures consisted of three debris basins, two retention dams, and a floodway channel. The channel collects water from two main debris basins and a retention dam, and diverts it away from Cedar City on a non-erosive grade.

Just above Highway 91 the earth floodway channel leads water over a concrete drop structure into a concrete lined section where it is conveyed to the main retention dam. This dam will retain the water and release it at a controlled rate, bypassing Cedar City completely. When completed, the project, including Federal, municipal, county, and private costs will amount to \$334,200.



Nearly 7,000 of the 8,500 girls attending national Girl Scout Senior Roundup in Colorado last summer went through the conservation exhibit tent.

## SCS to help in Radioactive Work

The Soil Conservation Service is preparing to assume new responsibilities, along with other agencies, for monitoring radioactive fallout on agricultural land and water and on stored and harvestable crops during emergency conditions.

SCS work unit personnel soon will be responsible for such measurements at 320 locations throughout the country and the number may increase later. Other agencies will collect similar facts at more than 600 stations for use of the Office of Civil and Defense Mobilization.

State soil scientists of SCS will attend one of three training sessions this fall where they will learn how to use radiation-monitoring equipment being provided by OCDM, and how to interpret the readings. Specially trained representatives of the Soil Conservation Service and Agricultural Research Service will conduct the training schools.

This activity is part of a longtime program being developed to carry out the responsibilities of agriculture in the field of National defense. Peacetime uses of atomic energy are being developed rapidly and the number of reactors being constructed will increase. The possibility of reactor accidents which would release radioactive materials is recognized.

In case of reactor accidents or war, SCS technicians and other agricultural scientists would need to understand and be able to explain to land operators the relationship between radioactive content of soil or water and land use, crop production, and the use and management of soil and water resources.

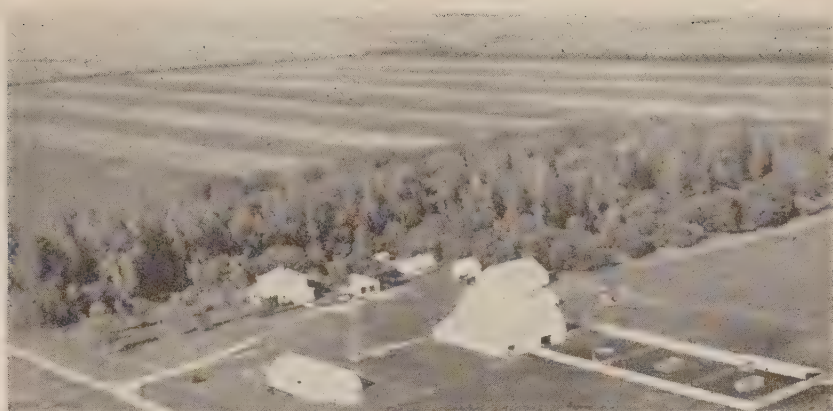
Such a program of monitoring fallout will be a regular part of a peacetime program in this atomic age because of the potential effect of radioactive materials on soils, water, crops, foods, and livestock. In the event of a war emergency, officials point out, this monitoring would be an important part of defense activities.



Old Two-Toes was a famous wolf in Wisconsin. He had escaped guns, hunters, traps, and dogs for many years. Last year the bounty system was abolished and wolves placed on the protected list. Old Two-Toes promptly got run over by an automobile.

# What Is A Conservation Farmer?

By NORTON STANGELAND



“**C**ONSERVATION farmer” is becoming a more common term in everyday language. What does it mean? One good answer is found in the experience of J. Harvey Lyman.

Mr. Lyman lives 4 miles northeast of Grace City, N. Dak. He owns a 1,120-acre farm which he operates with the help of his two sons, Roger and Harvey, Jr., and his wife Lazetta. In addition he rents 160 acres of pasture.

The Lyman family first took over the farm as tenants in 1937. Previous operators had proved that the soil did blow. They had not farmed 200 acres of cropland for 2 years because of the danger of soil blowing. This was not the only farm in the community that was bothered with soil drifting. A nearby quarter section was so badly eroded that a man on

horseback could hide in the blow-outs.

Lyman realized the need for drastic measures to control soil blowing on this farm. He began farming strips, laid out in 20 rod widths, in the spring of 1938. This strip farming, the first seen in the community, caused much amusement among local people. To quote Lyman, “People thought I was off my rocker when they saw my strip farming for the first time.”

Lyman planted his first half-mile field shelter-belt in 1939 under the Prairie States Forestry Project. He planted his second half-mile in 1940 when he purchased the farm. Others in the community were observing the results of Lyman’s system. Some began using similar practices on a small scale. Some needed encouragement.

Frank Johnson, then county agent, knew of Lyman’s system of farming. He also knew that

Note:—The author is work unit conservationist, Soil Conservation Service, Carrington, N. Dak.

Norton Stangeland (left) and J. H. Lyman inspect wheat protected by field windbreak in background.



Purebred Herefords graze one of five pastures on Lyman farm, with stockwater dugout in foreground.





more farmers needed to do likewise. He began holding educational meetings that led to the organization of the Foster County Soil Conservation District in December 1944. It was only natural that Lyman be elected to the first board of district supervisors and chosen chairman. The board of supervisors manages the affairs of the district.

Lyman became cooperator number nine of the Foster County Soil Conservation District and worked out a basic conservation plan with the local soil conservation district. Soil Conservation Service technicians had been assigned to the district at the request of the supervisors. The first step was a soil survey of the farm and a land capability inventory. The soils proved to be mostly deep, very sandy, with very rapidly permeable subsoils.

In working out the basic conservation plan, Lyman reduced the strips of cropland from 20 rods to 15 and 10 rod widths. He decided on a crop rotation of corn, small grain, and grass and alfalfa for 4 or 5 years to help maintain fertility. Approximately 125 acres are in tame grass each year. Lyman applies commercial fertilizer and barnyard manure and leaves the stubble after the small grain harvest. Sometimes livestock graze the stubble but never long

enough to expose soil to winter winds.

Field shelterbelts now total 4 miles and additional trees protect the farmstead and lots.

The amount of grass that grows each year determines the number of cattle allowed on the pastures. Livestock is allowed to eat about half the annual growth. Such a practice keeps the grass strong and enables it to produce more the following year. Three stockwater ponds properly placed in the pastures help distribute the grazing. More are planned.

Wildlife receives encouragement all over the farm. to quote Harvey, "I have lots of wildlife on my farm including deer, a variety of fur bearers, grouse, Hungarian partridge, and duck. I now have young duck on my stockwater ponds which I didn't have before."

All this has been made possible because Lyman works closely with his soil conservation district. The district has made available equipment, seed, planting stock, and labor. The Soil Conservation Service assisting the district has provided the technical assistance and know-how. Many of the conservation practices that Lyman has applied were done with financial help of the ACP cost-sharing program administered by the County Agricultural Stabilization Conservation Committee.

*Conservationists focus attention on soil with*

## *New Commemorative Stamp*

The world's first commemorative soil conservation stamp is now helping carry the symbol of modern soil and water conservation throughout the United States and the world.

The three-color U. S. Postage stamp was first released August 26 at the annual meeting of the Soil Conservation Society of America in Rapid City, S. Dak.

The postmaster and his staff at Rapid City are glad that the rush is over. The top picture shows just part of the many thousands of first day covers (special envelopes) sent to the Rapid City Post Office to be mailed out under the new stamp. The first day covers are a choice item for stamp collectors. Viewing a few boxes of

first day covers are Mrs. Don Ridley and Postmaster George Lampert, Rapid City. Mrs. Ridley is the wife of Rancher Don Ridley, operator of 1,500 acres near St. Onge, S. Dak., and cooperator with the Lawrence County Soil Conservation District.

Throughout the United States, organizations used the announcement of the new stamp to focus attention on soil and water resources and their importance to townspeople and industry as well as farmers and ranchers.

Many local soil conservation districts and state associations of districts arranged for use of the commemorative stamp on their newsletters or other regular mailings.

Local committees organized and conducted special ceremonies. Special displays in fair booths, windows, and lobbies were reported. In a soil conservation district in Texas merchants bought 10,000 stamps in one special ceremony. Pictures of local purchasers of the first stamp appeared in dozens of papers and on TV stations. Radio stations reminded people to buy.

In lower picture, Marlinda Mason, Miss Colorado for 1959, takes time out from her duties with Colorado State Department of Agriculture to help launch the new stamp. With her is Clarence Foster (left) president of the Colorado Association of Soil Conservation Districts and Ted Hefner, Denver Postmaster whose interest in commemorative stamps dates from his early rookie mail clerk days, discussing how to sell 1½ million soil conservation stamps through Denver's 34 branch postoffices.

Among the many organizations participating in various ways were local soil conservation districts, local, State, and Federal agricultural agencies, Postmasters, the National Rural Letter Carriers Association and its members, newspapers, magazines, radio, and television stations, civic clubs, and professional organizations, women's clubs, youth groups, industry and business organizations.

Unlike most commemorative stamps, this one honored no individual, place, or event. Rather it was designed as a tribute to the farmers and ranchers and their local soil conservation districts who have made modern soil and water conservation effective in keeping and using wisely the Nation's basic resources.

Likewise, it is a tribute to all who have helped farmers or ranchers and their districts to do the job.

Printing the 120 million stamps by the Bureau of Engraving and Printing in Washington required 10 working days, three 8-hour shifts per day, and about 17 tons of paper. Sheets of 200 stamps rolled off the presses at the rate of 2,000 sheets per hour.

The center picture shows L. Rohe Walter (left), Special Assistant to the Postmaster General, and Donald A. Williams, Administrator of the Soil Conservation Service, inspecting a sheet of stamps which has just come off the press.





# Bear Hole Watershed Pay-Off

By GORDON SMITH

**I**N March 1959, the Bear Hole watershed project in Delaware was finished. Four months later a rainstorm hit the area with the intensity expected only once every half century. People who have lived there longer than that said they had never seen such a downpour.

Thirteen inches of rain fell in 6 days, July 10 to 15. Half of that fell between 2 a.m. and noon on July 15 after the earth had been saturated. The crop growing season was at its peak.

But Bear Hole watershed handled the deluge with an estimated crop damage of only \$2,000. Farmers in unprotected areas counted up damages five times as great.

Scalding caused the damage. The corn and soybeans drooped when the sun hit the standing water.

The second day after the rain stopped, Bear Hole watershed farmers were in the fields on tractors. In wholly unprotected areas, farmers still were unable to get into their fields by August 3.

Flood reduction isn't the only benefit the Bear Hole watershed project has brought to the State.

"Farmland values around here have jumped 25 percent in 2 years." That's John McCabe speaking. He owns 75 acres of good corn and soybean land near Roxana.

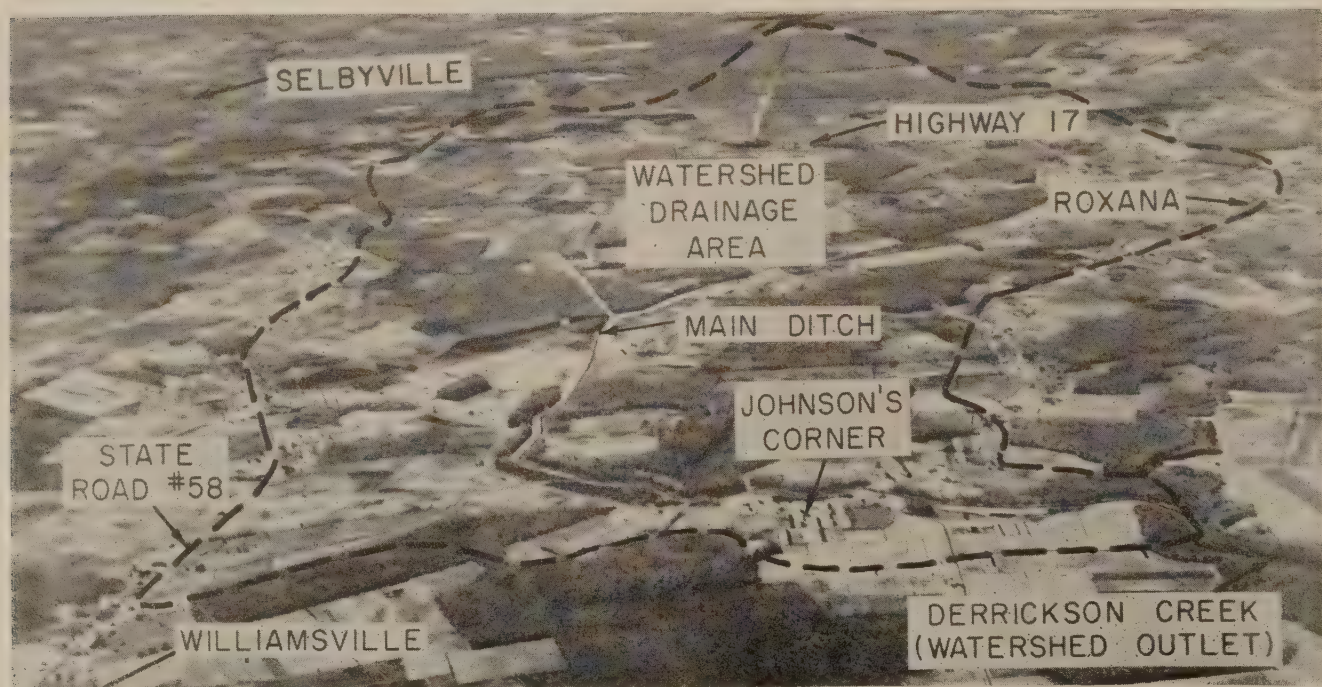
A land boom? To the 120 farmers in the 4,523-acre Bear Hole watershed it amounts to the same thing, only better.

Bear Hole had the honor of getting the first approval in the United States under the Watershed Protection and Flood Prevention Act (Public Law 566) passed by Congress in 1954.

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Note:—The author is information specialist, Soil Conservation Service, Upper Darby, Pa.

Dotted line shows boundary of 4,523-acre Bear Hole watershed. Main channel starts in top center, comes through middle and out near Johnson's Corner.





Contractors started moving dirt in September 1956. Thirty months later, they had licked a flooding and drainage problem that had troubled farmers since colonial days.

Though actually completed early in 1959, work was far enough along the year before to show monetary benefits.

McCabe explains, "Before we started this project our crops would do pretty well in a dry summer. But, if it was a wet one, most of us lost our crop."

Bear Hole, like much of southern Delaware, is flat and fertile. It's good cropland, but the problem has always been to get excess rain off the flat topography. Early colonizers removed excess water from their lands by forming organizations and digging community ditches with taxes in money or assessments of labor. Tax Ditches—as they are known today—still operate throughout Delaware agriculture.

Lacking power machinery, early work took years to complete. At best, the results were inadequate. Woodlands were hard to clear and ditch. Main channels were narrow and shallow. They silted up almost as fast as they were dug.

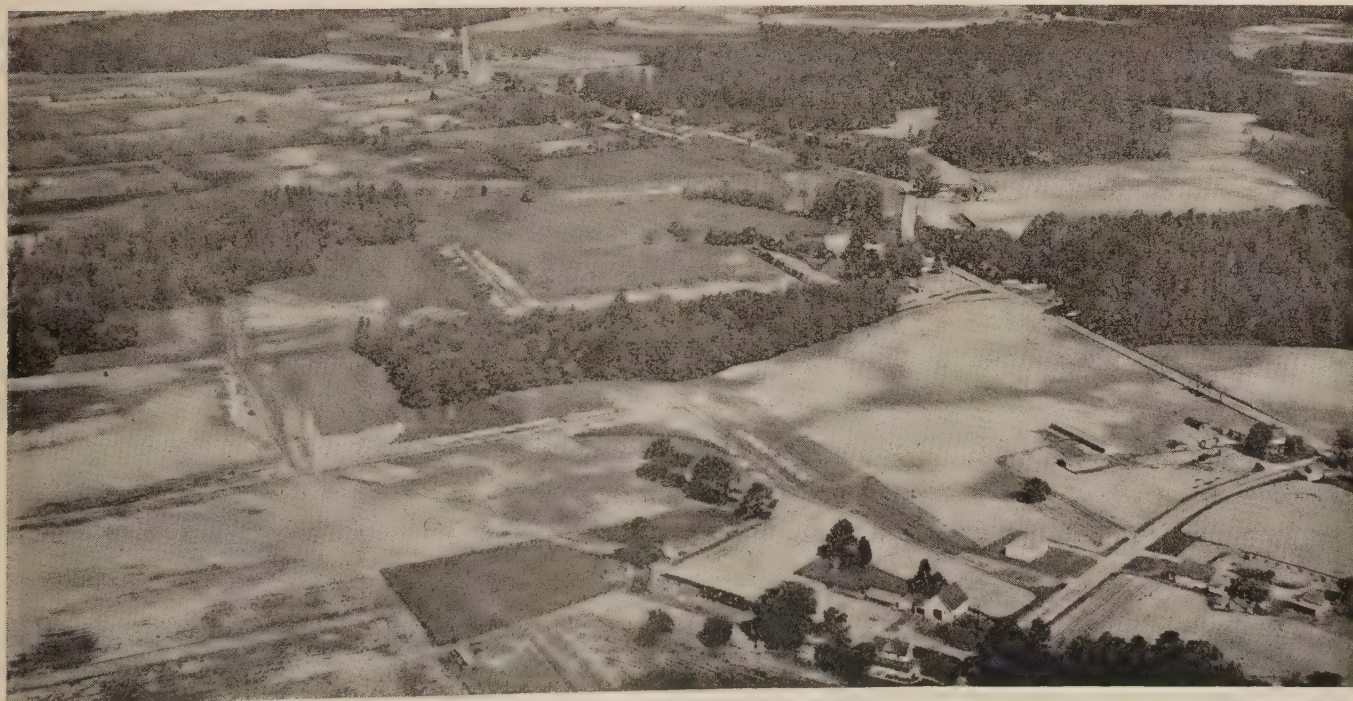
The CCC boys took their turn at a project in the Bear Hole Areas in the late 1930's. They

completed a survey of the main channels, but World War II stopped further efforts. The local Tax Ditch became inactive. The main channel became silt-clogged and useless. Dropping farm economy after the war spoiled chances for improving it. Arch Hudson, Selbyville farmer located on the edge of the new main channel, recalls, "We'd have been out of business for good in less than 5 years the way things were going. I lost my corn crop almost every fall. The ditches just couldn't handle the rain."

When the new PL-566 Watershed Act became law, the State Soil Conservation Commission of Delaware took quick steps to bring this aid to Bear Hole. It applied for assistance and sponsored the project. The Bear Hole Tax Ditch was reorganized under new Delaware drainage laws and became the contracting organization.

The Bear Hole Tax Ditch negotiated a contract with the soil conservation district of Sussex County. In all, 29 miles of main outlet channel were constructed, including 19 prongs leading to it. Channels were punched through miles of dense woodland, a job considered impossible in bygone years. Spoil banks were leveled along the new channels and seeded with lespedeza by the State Fish and Game Department as a wildlife improvement measure.

Bear Hole watershed land is flat, fertile, and produces good crops if not flooded or waterlogged. The James Savage, Cora Long, and Jeanna Evans farms are among those benefitting from the watershed program.





As the new work was completed, farmers were able to improve their own farm drainage systems by tying into the prongs. Over 20 miles of farm drainage systems, designed by Soil Conservation Service technicians, have been established by farmers cooperating with the Sussex County Soil Conservation District.

Fields have changed shape to follow the new drainage pattern. Hedgerows are being removed and recently abandoned fields are again part of the farm operation. Crop rotation, cover cropping, stubble mulching, and land-smoothing measures are being used by farmers as part of the overall watershed protection plan. SCS technicians prescribe these measures to cut water runoff, reduce siltation of the new channels, and build soil fertility. Many of the farmers have planted wildlife food and cover plants along their field borders.

County ACP payments help farmers meet some of the expense. Costs of watershed improvements, such as main channel and prong ditch work, are shared by Federal, state and local funds. Local people paid about 17 cents of each dollar spent on the contract costs of improvements. The Tax Ditch is responsible for channel maintenance.

Farmers aren't the only ones benefiting from the watershed project. Floods no longer are a threat to homes in Roxana and Johnson's Corner. Improved channels keep high water off the roads. Flood damage repairs in the towns and on the roads will be reduced to a fraction of former costs.

Partly because of the success on the Bear Hole Area, a similar project is starting on the Upper Nanticoke Creek less than 20 miles away. The new project will cover 120,000 acres or one-fifth of Sussex County. It will take an estimated 10 years and \$2¼ million to build over 350 miles of outlet channels. Thousands of farmers and numerous towns will be affected by this one project. Other watersheds in Delaware are applying for aid under Public Law 566. In the not-far-off future much of the state may be affected by the new watershed approach to conservation.

Bear Hole farmers are proud they led the way.



Forty percent of the farmers produce 90 percent of our agricultural products.

## **Officials of 19 countries study U. S. watersheds**

Thirty-two representatives of 19 countries are on an extended field trip to study watershed management programs and activities in the United States. The tour started with a seminar in Washington August 10 and will end October 5.

Participants scheduled to attend represent Argentina, Brazil, Burma, Chile, Ceylon, El Salvador, Greece, Honduras, India, Israel, Jamaica, Madagascar, New Zealand, Pakistan, the Philippine Republic, Sudan, Thailand, Turkey, and Venezuela. They include officers responsible for planning or directing agricultural and forestry programs.

The tour includes visits to watershed protection and improvement activities in Arizona, California, Colorado, Delaware, Georgia, Michigan, Mississippi, Nebraska, North Carolina, Ohio, Oklahoma, Pennsylvania, Texas, Utah, West Virginia, and Wyoming.

A number of Federal and local agencies are cooperating with the Food and Agriculture Organization of the United Nations in the seminar in conducting the event.

A lively interest in watershed management developing around the world led to the request for such a study. This approach opens up vast possibilities for raising living standards in under-developed countries as well as maintaining and expanding the energy and agricultural supplies of many of the economically developed countries, says FAO.

## ***Grazing retards tree reproduction***

Research at The University of Wisconsin indicates that grazing of farm woodlots reduces the plantfood available for reproduction of trees. Soil Scientists A. L. Leaf and S. A. Wilde state that such depletion of soil nutrients retards tree reproduction because topsoil serves as a natural seedbed for new trees.

The researchers analyzed tree litter from both grazed and ungrazed woodlots and topsoil around the trees. Plant food levels—calcium, phosphorus, potassium and nitrogen—proved to be lower on grazed plots.



Many of us spend half our time wishing for things we could have if we didn't spend half our time wishing.—Alexander Woollcott.

## DISTRICT PROFILE

WILLIAM A.  
HUNT  
of  
FLORIDA

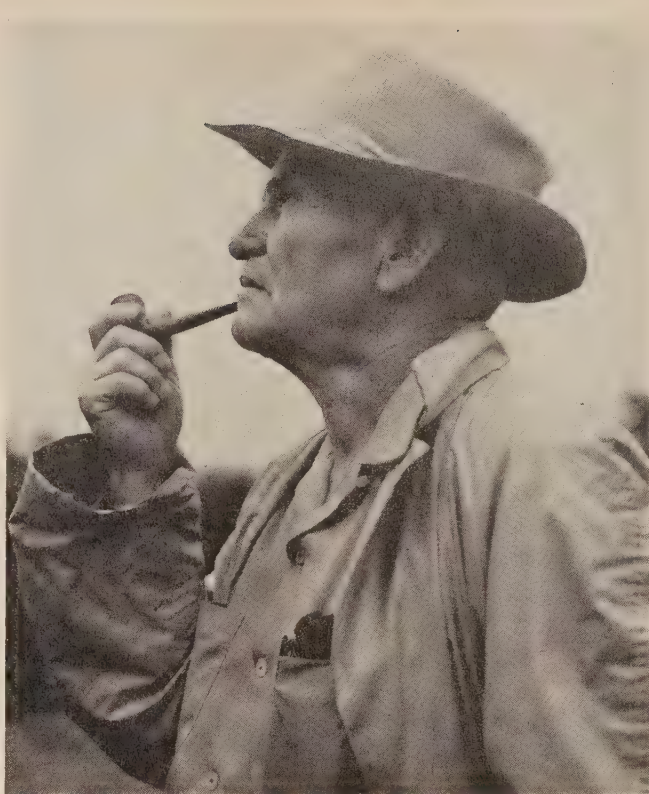
I would call William A. "Bill" Hunt, president of the Florida Association of SCD supervisors, a character, except that the word character has come to mean an odd or eccentric person. What Bill is, is a unique and extraordinary person. He has a bluff, colorful personality, and a blunt way of speaking that startles people and puts them on the defensive at first. But soon they learn that it's just a coverup for a social conscience that he's reluctant to let people find out about.

His conversation is larded with jests, sophisticated humor, and plain cracker barrel philosophy. But when he starts talking about soil and water conservation, his conversation becomes serious and straight-forward and his personality undergoes a complete change. On first meeting Bill one might think he is not particularly interested in soil conservation or the district program. But he's deeply interested and he says that being state president and chairman of his local board is a pleasure instead of a task, and that he considers it a privilege to serve.

Bill Hunt owns his own plane and travels all over the Nation to conservation meetings. As a result he is keenly aware of the national soil and water conservation problem as well as the problems of Florida and the citrus industry. He has a thorough understanding of the soil conservation district program and how it can be used to solve these problems.

Bill has an inexhaustible fund of stories. One of his favorites concerns a fertilizer salesman from Jacksonville who called on him at the grove one day. After he'd been in the grove a while, the salesman asked Bill why his fruit was so clean and the foliage so green and shiny.

(In Florida, an orange on the tree has a rusty, scaly appearance and is entirely different looking from one that you buy at the supermarket after it has been cleaned and treated. That is, most places except at Bill's groves. There the fruit is clean and the leaves polished until they glisten.)



Bill Hunt, colorful, unorthodox citrus grower, ardent conservationist, and president of the Florida Association of Soil Conservation Districts.

Bill told the fertilizer salesman, "It's because I come down to the groves every morning with wax and a buffer and polish the leaves."

Knowing Bill's penchant for kidding, the salesman smiled politely and then said, "Really, Bill, why are the leaves so shiny?"

"Well seriously," said Bill, "it's because I keep snails that clean up the leaves and the fruit."

"Now I know you're lying," said the salesman.

I thought so, too, when H. G. Dasher, area conservationist at Marianna, told me the story, but I learned subsequently that Bill does indeed keep snails in his groves to clean up the fruit and the foliage.

This is just one example of Bill's unorthodoxy. Another is not spraying his groves. There hasn't been a spray wagon on his place in 10 years. A group of entomologists visited his grove and had to search hard to find a single bug. Near his place in a grove where the owner did spray the entomologists got a hatful of bugs including Texas mites, spotted mites, purple mites, and others.



Bill doesn't cultivate his groves either. Instead, he allows the native Florida vegetation, which grows lush in the State's subtropical climate, to grow until it's several feet high. Then he cuts it into the soil.

"I believe it's much better for the trees and for the land not to cultivate or spray," Bill says. "Production may not be as high. I'll grant you. Cultivation and spraying will probably stimulate the trees to produce more but at the same time production costs are greater. And when you look at the black figures at the bottom of the page, mine will be larger than most of those who spray and cultivate.

"Of course," he adds, "there are a thousand different ways of producing citrus. Every grove owner has a different way. And nearly all of them work, at least for a while, because trees want to grow and bear fruit.

His system apparently works. His trees are vigorous and healthy, the soil in his groves mellow and crumbly, and the citrus is first-quality fruit.

Besides practicing soil and water conservation in his own groves, Bill spends a lot of time working to interest farmers throughout Lake County in the district program. Although considerable progress has been made, about the only obvious practice to be seen in the groves is contouring and you don't see too much of that, he admits, because it's too expensive to pull up the old trees, which were set out in the conventional row arrangement, and replant them on the contour. Also grove owners believe the trees will do better when planted in straight rows up and down the slope for air drainage.

"But, by and large, we're making progress," he continued. "Where trees are killed by cold, more and more of the owners are replanting on the contour."

He says that there are 637,440 acres of land in Lake County and only 120,000 acres in groves, so there's plenty of land where conservation is in use and apparent.

These practices include cover cropping, drainage, irrigation, wind stripping, tree planting, well construction, farm ponds, and mulch farming.

One important practice gaining in popularity is the use of pasture for feed and forage reserves. Farmers employing this practice keep their cattle off a pasture for a certain length of

time, then mow it for hay or silage, or leave the pasture for winter grazing.

Another important conservation practice steadily growing in favor is planting cover crops in groves—oats, rye, or blue lupine—not only for soil improvement but for wind-erosion control in the spring.

The day after I visited him, I was in the State office talking with Colin Gunn and Hamp Dasher about the events of the previous day. After Dasher had told several stories about him, Gunn said, "You're going to make a legend out of Bill Hunt."

Dasher replied, "He's already one."

Whether he is or not, he's many things—raconteur, bon vivant, sportsman, and conservationist. And I daresay that of the four, he'd rather be known as conservationist.

—LEON J. SISK

### *Working Together*

Representatives of the Soil Conservation Service and officials of the National Association of Soil Conservation Districts have prepared a joint program of action for maintaining and improving working relations between SCS and local soil conservation districts. Each organization is distributing the program to its own people. The document outlines responsibilities, objectives, problems, and working principles.

"Important as these relationships are at State and National levels," the Foreword states, "the effective operation of the soil and water conservation program is finally achieved by people working together in a local soil conservation district."

### *New facts on winter hardiness*

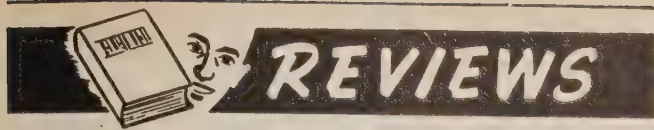
Recent tests at the University of Wisconsin indicate that winter-hardiness of red clover and alfalfa hinges on such factors as when cold weather strikes, carbohydrate levels in roots and crowns, and even soil fertility.

Levels of soil phosphorus and potassium influence cold resistance. The plant is better able to withstand cold when plenty of these nutrients are in the soil.

Cold resistance increases from September to about mid-December and plants are best able to resist cold from mid-December until early February.



SCS published 37 soil survey reports, mostly on a county basis, for areas in 22 states, last fiscal year.



**FUNDAMENTALS OF ECOLOGY.** By Eugene P. Odum, in collaboration with Howard T. Odum. 546 pp. Illus. 2d Edition. Philadelphia and London: W. B. Saunders Co. \$7.50.

THE art of soil and water conservation, as practiced by the Soil Conservation Service, brings to bear on each land area all the diverse technologies that can help to analyse and solve its land use and conservation problems.

In the same way, the science of ecology, as presented in Odum's *Fundamentals of Ecology*, calls upon all the basic sciences that can help to explain the natural phenomena of life and its physical environment. Such a composite science provides a logical basis for the technology of conservation.

This is the second edition of Odum's book. The first appeared in 1953. Its functional approach to the subject and its logical organization won it ready acceptance as a general text in ecology. Increasing interest in the subject and expanding horizons of science and technology since that time have prompted an early revision of the book.

The changes are mainly additions of new material. Especially noteworthy is the chapter on the entirely new subject of radiation ecology. New paragraphs and sections are interspersed throughout the text.

The unique organization of the book aids the reader to understand the subject even though this may be his first introduction to it. The three major divisions are devoted in order to theory, description, and application.

Part I, the longest, sets forth the fundamental principles of ecology. Each concept is presented first as a concise summary *statement*, then elaborated in an *explanation*, and illustrated by *examples*. Some fifty separate ideas are given this treatment under the following general headings: (a) the ecosystem and biogeochemical cycles, (b) energy in ecological systems, (c) limiting factors, (d) species populations, (e) interspecies populations, and (f) biotic communities.

Whereas Part I deals with function, Part II deals with structure of ecosystems (i.e., living organisms of an area and their physical environment). It describes the principal habitats of the world and their biotic communities. In this way it illustrates with concrete examples how the principles stated in Part I operate in freshwater, marine, and terrestrial environments.

Part III is concerned with the application of ecological principles to practical matters. Heading the list is conservation. According to the author, the aim of conservation is not "hoarding" for the future but "to insure a continuous yield of useful plants, animals, and materials, by establishing a balanced cycle of harvest and renewal." The ecosystem, he says, is the basic and most important principle underlying conservation.

The chapter on radiation ecology reviews nuclear concepts and terminology and gives information on the comparative sensitivity of organisms to radiation and the fate of radioactive materials in the environment. It discusses the new problems of fallout and waste-disposal.

The final chapter considers the relation of the growing human population to natural resources. The author finds considerable reassurance in the principles of ecology which suggest that ecological systems, including human population, are subject to self-activating controls. Knowledge of these principles will enable man to manage and use natural resources more wisely. But, he warns, man is a part of these systems; he did not create them and he cannot live independently of them.

—BEN OSBORN

**SOIL CONSERVATION WORKBOOK.** 48 pp. Illus. 1959. Danville, Ill.: Interstate Printers and Publishers, Inc. 75¢.

THIS is a text-workbook containing nine chapters with a bibliography listing 11 titles. It is well organized and profusely illustrated. Each chapter has blank spaces for problem-solving and for answering questions related to the text. Instructions and illustrations on how to set up classroom and field demonstrations, and observations to be made, are complete



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and simple enough for the do-it-yourself advocate.

The text briefly covers the fundamentals of man's dependence on the soil, how soil is formed, kinds of soil, plant foods, soil moisture, and erosion and its control. A chapter on THE GOVERNMENT AND SOIL CONSERVATION gives a brief account of soil conservation districts and how technicians of the Soil Conservation Service work with farmers to conserve soil and water.

The workbook will be valuable as a study unit in soil conservation or as a supplementary teaching aid. It may be used both in science and social-studies classes, grades 5 to 9.

Leaders and members of youth organizations such as Boy Scouts, Girl Scouts, Camp Fire Girls, and 4-H Clubs will find the workbook helpful in carrying out their conservation objectives.

Much of the information contained in the workbook is related to the 56-page book, *This Is Our Soil*, by Ernest D. Walker and Albert B. Foster, published by Interstate and available at 50¢ per copy.

—ADRIAN C. FOX

Marion (Ohio) Soil Conservation District supervisors are sponsoring the photographing from the air of tile systems on district co-operators farms during final installation to provide permanent record of tile line locations.



A study of longtime relationships of crop yields to climate and soil types in the Great Plains is underway.

### ***Dennis the Menace rediscovers dirt***

The Soil Conservation Society of America has announced the publication of a new cartoon-type booklet, DENNIS THE MENACE AND DIRT. Through 20 pages of color cartoon-type strips, the famous little Dennis rediscovers dirt, which he already dearly loved, and is astounded at what his parents tell him about its importance. As a result, Dennis becomes an ardent conservationist in a way which will not bring joy to any mother's heart.

Hank Ketcham, creator of the lovable character, and his staff, planned the booklet with representatives of the society to help bring home the story of soil and water conservation. This is the first time Dennis has appeared in any form other than his regular comic strips and cartoons.

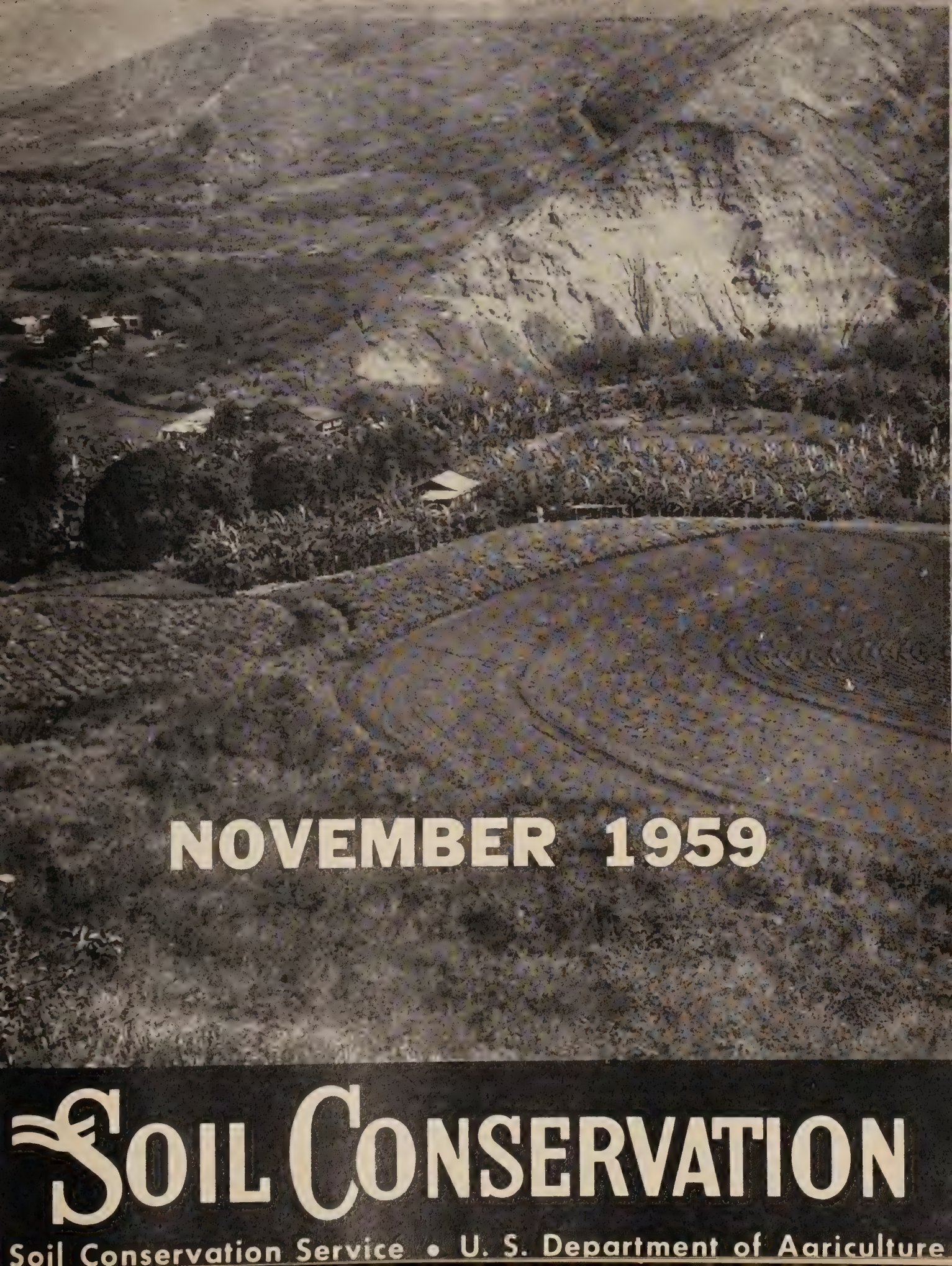
Mr. Ketcham is a cooperator with the Carmel Valley Soil Conservation District. He has a conservation plan in operation on his 61-acre ranch in Carmel Valley, Calif., developed with the help of Soil Conservation Service technicians.

Ketcham's program included reseeding of pastures, rotation grazing, woodland management, an irrigation system, more legumes, and a 1-acre pond stocked with trout.



The South Dakota Agricultural Extension Service has published a revised edition of its circular, ORGANIZING WATERSHEDS IN SOUTH DAKOTA.





**NOVEMBER 1959**

# **Soil Conservation**

Soil Conservation Service • U. S. Department of Agriculture



# SOIL CONSERVATION.

**EZRA TAFT BENSON**  
SECRETARY OF AGRICULTURE

**DONALD A. WILLIAMS**  
ADMINISTRATOR, SOIL CONSERVATION SERVICE

OFFICIAL ORGAN OF THE SOIL CONSERVATION SERVICE  
U. S. DEPARTMENT OF AGRICULTURE, WASHINGTON, D. C.

NOVEMBER—1959

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TOM DALE, Editor

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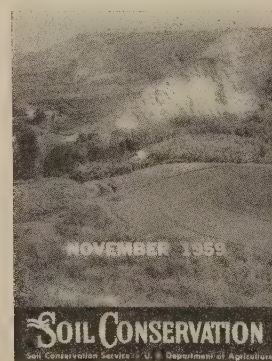
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HAWAII, our 50th State, ranks 47th in area, being slightly larger than the combined areas of Connecticut and Rhode Island. In population it ranks 44th, or an estimated 645,000 (July 1, 1959) exceeding N. H., Del., Vt., Wyo., Nev., and Alaska.

Unusual among world truck farming, Hawaii can produce eight or more vegetable crops in a year on the same acreage. The agricultural income per farm worker is 4th highest among the 50 States. Total agricultural production is 37th. In 1950, there were 5,650 farms of which 3,558 are less than 10 acres. Ninety-five percent of the cultivated land is devoted to sugarcane and pineapple production.

Principal industries are sugar, pineapple, tourism, livestock, coffee, and fish. Hawaii's sugar production per acre is the highest in the world equaling about 3 percent of the world's sugar production.

(Continued on back page.)



**FRONT COVER.**—Terraced and contoured truck and pineapple farms in the foreground with eroded wasteland and rangeland in the background on island of Oahu, Hawaii.

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## To Mainlanders from the State Association of Soil Conservation Districts of Hawaii.

By F. E. SCHATTAUER

**A** LOHA to all State Associations of Soil Conservation Districts, and their members, from the State of Hawaii Association of Soil Conservation Districts and its 16 member districts. Our State association was organized in 1954 and we have come a long way since that time. The farmers and ranchers who operate the State association take great pride in all phases of the progress made in developing an association which is alert to their needs in the new State of Hawaii.

With the complex soil and climatic conditions existing in the islands, the farmers and ranchers did not in many instances possess the technical "know-how" which meant the difference between success and failure. With the organization of the first soil conservation districts

more than 10 years ago, economic improvement was soon observed in many areas.

The SCS technical staff assigned to the districts worked closely with the technicians on the plantations and ranches and with farmers. Their work was coordinated, new ideas were advanced, and many of them were soon put into use and considered a part of normal procedure on many of the sugar and beef operations and truck and fruit farms.

Renewed interest in ranching and farming is in evidence throughout the State of Hawaii. The introduction of new species of grasses and legumes, adapted to the various vegetative and climatic zones, enables us now to have lush green pastures at practically all elevations.

The State Association of Soil Conservation Districts of Hawaii extends friendly greetings to our mainland friends and invites them to visit our new State and observe many of the wonderful changes which are now taking place.

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Note:—The author is president, Hawaii Association of Soil Conservation Districts, Kau, Hawaii.



# Conservation Problems—

## In The State of Hawaii

By J. H. CHRIST



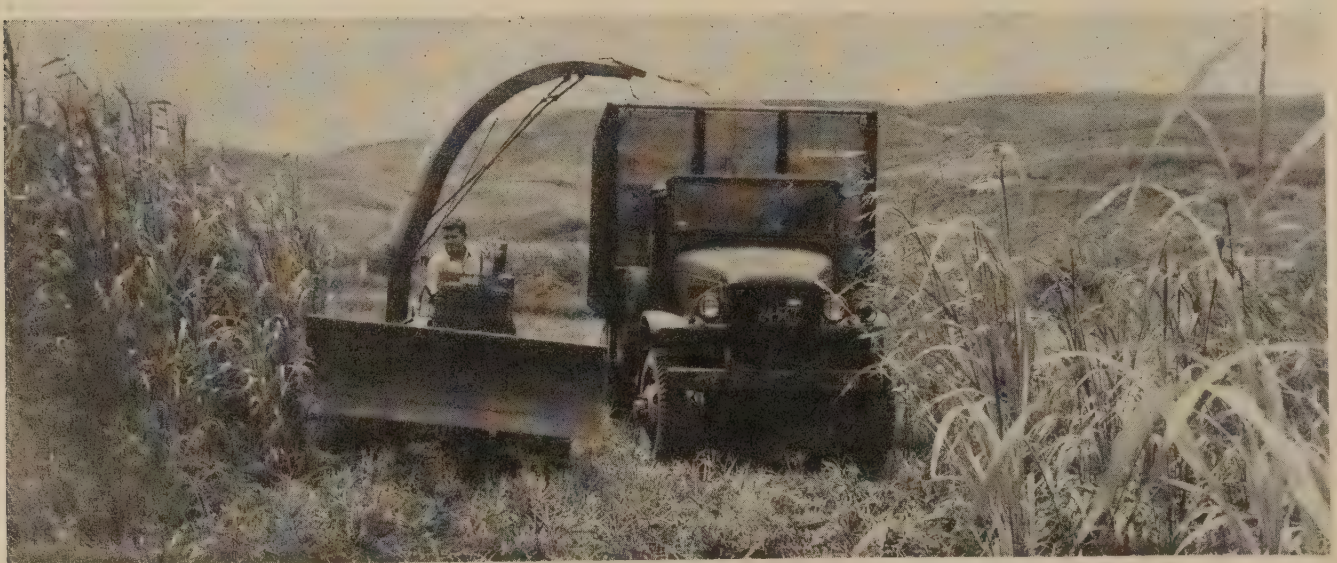
Big trefoil grown as a cover crop in a coffee plantation.

**L**AND is a precious commodity in Hawaii. The ancient Hawaiians lived close to the soil. The taro patch was the primary source of food. Kamehameha III phrased the motto of Hawaii that continues to be expressive, "UA MAU KE O KA AINA I KA PONO," or the life of the land is perpetuated in righteousness. Even now agriculture is the basic industry of the islands, and a great number of the people live directly from the soil.

Today's sugar and pineapples provide the balance of trade of an advantageous economy. Livestock production, the coffee crop, exportable and locally used fruits, nuts, and vegetables also contribute importantly to the agricultural picture. Protecting the land while improving the methods of production is a key job for the conservationist.

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Note:—The author is State Conservationist, Soil Conservation Service, Honolulu, Hawaii.



Harvesting sudan and alfalfa crop for silage in the Kau Soil Conservation District.



Present-day travelers between the islands of the Hawaiian chain obtain an expressive picture of the land. Nowhere is it seen so vividly as by the air route, which is almost the sole means of interisland passenger transportation. Green fields, windbreaks, wooded mountain slopes, deep lush tropical valleys, and rain forests all emphasize the intent to clothe the land with protective measures.

Storms still take too large a toll of the good soil from unprotected fields and from poorly or unvegetated range and forest land.

Conservation problems here cover a wide range of conditions, many of them within narrow ranges of climatic and elevational limits. Farmer and rancher members of the Islands' 16 soil conservation districts are working out these tough soil and water problems together—working as a team. The public also is giving good support to the program aimed at protecting and improving Hawaii's land and water resources. And no one realizes more than the people the strict limitation of the islands' lands and the need to keep them productive and able to feed their growing population.

Sugarcane is the chief money crop of the islands and occupies most of the cultivated area. Slopes range from almost level coastal lands to those of 80-percent slope in higher elevations. Irrigation is a necessity in lee sections of the

islands having less than 55 inches of well-distributed rainfall. Some soils are very shallow, underlain with coral. Others are deep, friable, and highly permeable. Cane grown near sea level matures in about 18 months. Elsewhere, with increasing elevation, it may take cane upward of 46 months to mature.

These are some of the many and varied conditions found in producing a single crop. Landowners and conservationists run into varied conditions too in growing other crops such as pineapples, coffee, papayas, Macadamia nuts, mangoes, many truck crops, grasses, legumes, and trees that are adapted to this tropical area.

This gives you an idea of the tough job confronting land users and SCS technicians in using Hawaii's soils for their purposes and protecting them for long sustained profitable production.

Directors and cooperators of Hawaii's 16 soil conservation districts can be proud of the good conservation work they are carrying out on farms and ranches. Ranchers, farmers, sugar and pineapple plantation managers, and Soil Conservation Service technicians all have had a hand in applying soil and water practices and getting more and more conservation on the land.

Like mainland farmers, Hawaiians have a good many tough soil and water problems that call for expert technology. Drop in on some of



Dragline, owned by the East Kauai Soil Conservation District, digging a drainage ditch.



the islands' farms and ranches and you'll see their owners and SCS technicians in the field working out the answer to troublesome conservation problems.

Today, for example, they're designing structures to reduce damage from storms that dump upwards of 15 inches of rain in 24 hours, providing moisture-retaining cover crops for coffee trees growing in broken lava, and planning vertical drainage through watertight lavas to take off excess water. Tomorrow other conservation work may be needed.

A newcomer to this brand new island State finds more new and interesting features in farming here than in any similar size area of the United States.

Last year damage from torrential, high-intensity rains were effectively curbed where sugar plantations used diversion ditches, protected channel outlets, and stripcropping in their fields.

Papaya orchards often are hard hit by winds. Ninety percent of a full-bearing orchard may be destroyed by gusty winds that occasionally strike the islands. When orchards are protected by dense windbreaks of native ohia, special plantings of Norfolk Island pine, or swamp mahogany damage is light.

One large planting of acerola cherry, a high vitamin C crop, in the Puna SCD has an 11 mile, three-row planting shelterbelt of paper bark, a tree on the order of eucalyptus.

Cover crops are working out well in Macadamia nut, coffee, and papaya and mango orchards. Crotalaria, Spanish clover, and big trefoil are among the legumes used for this purpose. Cover crops of oats and vetch, a common mainland combination, is equally effective in the Waimanalo SCD on Oahu in protecting truck cropland during the critical rainy period of December to February.

Mulches are also proving effective on open truck crops or other open fields. Mulches are made up of bagasse, the fiber from sugar mills after sweet juices are removed, chopped up Napier or other heavy stemmed grasses, parchment from coffee berries, sawdust, and wood chips. All are used when available to the farmers.

Fencing paddocks, providing adequate water, supplying important growth minerals, and fertilizing improved forages are key management practices with Hawaiian livestock operators as with their mainland counterparts.

Rotation grazing finds a special usefulness in capitalizing on a 12-month grazing season.

Harvesting pineapples in Hawaii.



This favorable situation calls for more conservation work such as eliminating woody invaders in pastures, keeping out undesirable weeds, and shifting livestock to areas where animals gain on strong forage in contrast to losing weight on washy feed.

Buffel and blue panicgrasses grow in the driest 10- to 20-inch rainfall areas; guineagrass and koa haole, a shrubby legume, in the 20- to 40-inch areas; kikuyu, bermudagrasses, and kaimi clover, a *Desmodium*, in the 40- to 60-inch grass belts; and in the 60-inch plus areas pangola dallisgrasses and big trefoil show excellent adaptation. Each of these plant-use groups have special seasons of use and a definite regrowth period for favorable production.

Although parts of Hawaii are credited with world records in rainfall, 624 inches in a 12-month period in 1948 on Waialeale on Kauai Island, other areas require irrigation almost the year around. We're seeing more sprinkler systems on farms and ranches in SCD's on Molokai, Kauai, and Oahu. Gated pipe is being used effectively to make good use of water supplies.

Redesigning irrigation systems likewise provides for more effective use of water in contrast to old outmoded, wasteful, high labor cost distribution systems. Many Hawaii soils are very



Hawaiian pineapple field planted on the contour.

permeable, so much so they are totally unfit for reservoirs. Sealing materials such as asphalt panels, plastic films, or sprayed on asphalts are proving very useful in making good use of limited and valuable water supplies.

There's much more conservation work to do, but there is a firm, real desire by many Hawaiians to see that the lands of this Island Paradise continue to deserve the title. It is good to see the progress made in the last quarter century and to note the way many people are working to make Hawaii's lands safe and productive.

Laying asphalt membrane lining in irrigation ditch on Oahu, Hawaii.





# Better Homegrown Beef...

*For Hawaiian Consumers*

By CARL L. SUNDQUIST

**L**AST year, for the first time, Hawaii cattle producers stopped the steady climb of beef imports to the islands. This reduction from a 1957 high of 18 million pounds to the 1958 total importation of 16.5 million pounds is the result of a determined effort by local producers to capture more of the expanding island market.

Today 60 percent of the beef marketed is of island origin. It is the attractive \$7 million

plus which still goes to mainland and foreign shippers that is the root of the Hawaii cattlemen's campaign for better beef.

The lower grades of beef have been largely supplied from local sources since the lifting of the "kapu" or taboo, which forbade the slaughter of cattle, following their introduction to Hawaii by Captain George Vancouver, the English explorer, in 1793. In the 30 years that the original stock were protected, numbers increased to such a point that the "kapu" was lifted and beef became an important island food.

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Note:—The author is range specialist, Soil Conservation Service, Honolulu, Hawaii.

Hawaiian grown steers in a fattening lot.







Grade Hereford cattle grazing on 2-year old Kikuyu grass in the Kau Soil Conservation District.

However, not until the end of World War II was a change in meat tastes generally noticed. Perhaps it was the greater number of visitors to the islands, or the increasing population of the islands, many from the mainland, or it might have been the GI's who cultivated a liking for the superior grades of beef. But whatever the cause, the grass-grown cattle of the local producer failed to qualify for the fancy hotel trade and for the housewife seeking an attractive uniform cut of meat in the Choice and Prime U. S. grades.

Island producers hadn't quite anticipated this rapidly developing market change. But the handsome dollar package seen going to the import trade caused the local producers' organizations to quickly set their sights on a share of it. And hopefully they plan to pick up increasing amounts of it.

They are preparing to battle it out on the ground of pound-for-pound quality.

The Hawaii Meat Company in Honolulu, a cooperative of a number of the island's larger cattle producers, has designed Hawaii's first large-scale feeding operations. This is geared to market-feed 5,000 head of cattle at one time. Plans are to feed for 90 to 120 days to reach proper fleshing.

Island feeds figure strongly in the fattening diet for cattle. Around 120 acres of leveled

coral land at Ewa produces green chopped alfalfa for cattle in the modern feeding plant. Here the entire operation is mechanical, including water systems, feed mills, grain and molasses tanks, cattle pens, scales, and cattle working facilities. Molasses from the sugar mills, pineapple bran, a byproduct of the pineapple canneries, and fish meal from the local tuna canning industry are mixed with imported grain to bring about profitable gains on the animals.

The Kahua Ranch, another important livestock handling company, likewise has set its sights on a fair share of the outflowing beef dollars. Imported grain again figures strongly in the special fattening diet.

It is expected that Federal grading will start this year to put the U.S. Choice label on island beef.

Several individual producers also have started feeding operations to groom their cattle for the fancy trade.

Almost a fourth of Hawaii's 4.2 million acres is used as range and pasture land. These lands are found at elevations ranging from sea level to about 7,000 feet and with rainfall from 20 inches on the lee sides of the islands to 150 inches and above in the rain forests.

There is no sure-fire way to success. The





Livestock watering ponds at 6,000 feet elevation in the Mauna Kea Soil Conservation District of Hawaii.

island producer finds that he must be just as critical and far-sighted in his operations as his mainland competitor. Choosing high producing, nutritious grasses and legumes for his conditions; providing fencing to give good distribution to the cattle and utilization of pastures; developing water for the pasture units; providing shade from the tropical sun where needed; and fortifying the cattle, particularly the breeding herd, with essential mineral

elements to guarantee a high calf percentage are primary components in Hawaii cattle ranching.

Yes, Hawaii's 375 commercial producers say that they are going to have a fat slice of the almost \$8 million now going to the purchase of imported fat beef by Hawaiian beef consumers. They have the facilities to bring the animals along rapidly to marketable age, and right now they are developing the facilities to round out the entire picture through the finishing stages.

# Pasture Building

*At the Kulani Security Camp, Island of Hawaii*

By JAMES BUCHAN

ASK a mainlander today about the agriculture of our new State of Hawaii and more often than not he'll begin talking about sugarcane and pineapple. When it comes to cattle he probably thinks of the large white-faced herds of the West's wide-open spaces.

Hawaii isn't in it with the big beef producing States, but we believe we stack up pretty well in pasture building. Lands in our archipelago that once took acres and acres to graze a cow, now are feeding one or more head per acre. This is happening because more and more Hawaiian ranchers are clearing brushland, seeding better forage plants, and managing pastures the conservation way.

You've got to hack your way through much of the brushy and wooded cover on these semi-tropical islands, just as Captain James Cook did when he landed in 1778. It has taken a lot of clearing to provide grazing room for cattle.

One of the tightest vegetated spots I've seen is high up on the volcanic slopes of Mauna Loa on the Island of Hawaii. Here in this jungle-like setting in Hawaii's Kulani minimum security camp is a story about a pasture that was literally carved from the rough.

The other day, Warden Charles Smith said, "We've gotten real good results from our pasture building. We raise more beef now and there's more steaks and chops for the men.

"To get grazing room and better forage we cleared around 270 acres in 1951. The seeding

Note:—The author is soil conservation aid, Soil Conservation Service, Hilo, Hawaii.

we put in wasn't the best but we gained in feed. We needed more cattle and more feed, and in 1955 our new project farm manager, Manual Pacheco, began working with the Puna and Waiakea Soil Conservation Districts and Soil Conservation Service technicians assisting them.

"Our new pastures are turning out a lot of good feed. Most of them carry one head per acre now with better improved acres feeding two head per acre. That's on land that put out only skimpy feed a few years ago."

Since September 1955, SCS has helped Pacheco plan new paddocks and select grasses and legumes best suited to this 100-inch rainfall country.

Pacheco has worked hard at pasture building. So far he's cleared and seeded around 520 acres of brushy woodland. Another 250 acres were sprigged with pangolagrass and seeded to a mixture of big trefoil, orchardgrass, red-top, and crimson clover.

He fertilized the seeding with 16-20-0, using 200 pounds per acre every 3 months the first year.

The new pastures are divided into 40-acre paddocks and grazed in turn, 2 months on and 4 months off. Water troughs and pipelines are going in as soon as new grazing areas are developed.

On this good pasture and under good management, Pacheco is steadily building up the camp's beef herd which includes 53 breeding cows, two bulls, twenty-five 2-year old heifers, thirty-nine 2-year old steers, and four cows in the fattening paddock.

Warden Smith likes the way pasture building is going at Kulani. Puna and Waiakea district directors point out the camp's good-looking paddocks as a showplace for other ranchers to visit.

### *Seek better weather reports*

A set of instruments now being designed in a soils physics laboratory at the University of Wisconsin may give the farmer of tomorrow much better information about his best friend and worst enemy, the weather. The scientists seek low-cost, easily-operated equipment which can be used to set up a network of agricultural weather stations to do a better farm weather reporting job at a reasonable cost.

Weather information gathered by present methods may not apply to farms located some distance away. Weather stations already set up do not record some kinds of information crucial to farm needs or give information applicable to small areas.

Clearing land for pasture on the Kulani Security Camp acreage.



Manuel Pacheco in 15 month old stand of pangola and trefoil.







## Picture Report on Girl Scout City . . . .







# A Mile High And World Wide

**T**HE 10th largest city in Colorado appeared overnight on July 3, 1959. Literally encamped a mile high, it was to remain 10 days at the base of Pike's Peak and just across the highway from the U. S. Air Force Academy at Colorado Springs.

## THE PICTURES

(1) Colors of 28 nations and the 50 States line the Avenue of Flags. Pikes Peak is in background. (2) U.S. Army sergeants explain construction of concrete crossing on campsite prior to encampment. (3) Great Plains winds do not help in pitching tents. (4) Soil and water conservation exhibit attracts crowds. (5) Girls learn the importance of grasses in conservation programs. (6) Clem Dodson, State soil conservationist, SCS, Denver, uses watershed model exhibit to explain water cycle. (7) Troop 446 of Peoria, Ill., explain their own watershed exhibit. (8) SCS technician points out what can happen when erosion gets a start in sandy soil. (9) Girls handle topsoil and subsoil and hear why it is droughty. (10) SCS technician discusses 3- and 6-year-old Ponderosa pines; note range terraces in background which prevent formation of gullies below them. (11) W.S. Caton, SCS work unit conservationist, Colorado Springs, explains about native grasses. (12) Girl Scouts view 120-year-old Ponderosa pine.

The Second National Girl Scout Senior Roundup lived in this city of 6,000 tents and had for its citizens the Senior Girl Scouts from all over the U. S. and from 27 foreign nations; hence, the theme for the roundup—A MILE HIGH AND WORLD WIDE.

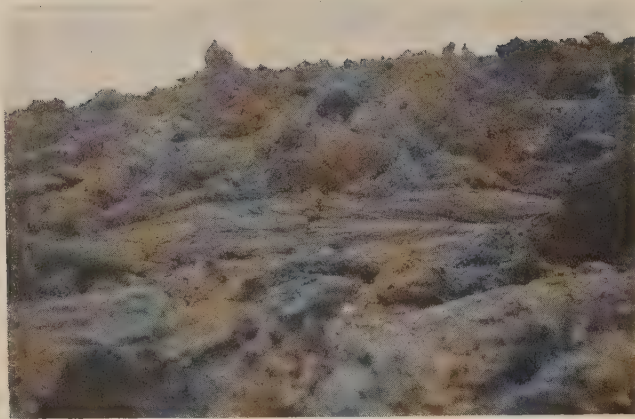
The Soil Conservation Service provided a Soil and Water Conservation Exhibit, developed a Conservation-Nature Trail, and prepared the text for a booklet, distributed to each girl scout, on "Conservation DOs and DON'Ts and Observation and Activities." It was printed by the Colorado Association of Soil Conservation Districts and the Colorado State Department of Agriculture.

The roundup conservation-district hosts were the Central Colorado Fountain Valley and The Black Squirrel Soil Conservation Districts.

Eighty percent of the Girl Scouts and their leaders visited the two attractions at least one time and some made several visits. No record could be kept of the many roundup guests—parents and friends—who also visited the Trail and the Exhibit.







Lava flow before preparation for planting.



Pangolagrass and big trefoil growing on lava flow only 3 years old.



Clearing ohia-fern rainforest on Aa for crop production.

By ROY P. YONCE and  
ROBERT C. MALMGREN

**M**OST American farmers would get a real shock if they had to begin growing fruits and vegetables in hardpan and bedrock. But many Hawaiians take rock farming in stride. They've been turning out crops on lava beds since long before Captain James Cook landed on their shores in 1778.

The Island of Hawaii is starting to make more use of its rocky land as a result of a continual desire of people to become landowners. Experience locally with such crops as Macadamia nut, coffee, and certain truck crops indicates the development of these lands for these crops is economically sound. The very fact that lava flows still occur on this island is one way of losing some of the good productive soil areas.

Note:—The authors are, respectively, work unit conservationist, Hilo, Hawaii, and soil scientist, Wailuku, Maui, Hawaii, both of the Soil Conservation Service.



Pahoehoe lava that has been fractured with a ripper in preparation for planting to coffee.



# Farming Lava Beds

## On The Island of Hawaii

This has, to some extent, put the "squeeze" on other lands.

In the Puna Soil Conservation District, on the Island of Hawaii, one-third of the farming is done on old lava beds.

Two major types of rocks occur as a result of lava flows: Aa, which is like cinders or clinkers and has a rough and broken surface; and Pahoe-hoe, which is massive bedrock with a relatively smooth surface. The type being used most successfully is the Aa. It occurs at depths up to 20 feet.

There are two major obstacles involved in development of such land for production: the cost of the land and the clearing. Much of this land, when it is available, sells for \$150 to \$200

per acre. This does not include a clearing and rolling operation, which costs about \$150 an acre. Rolling consists of pulling a 26,000-pound roller behind a tractor to compact and make a smoother surface to facilitate harvesting operations later. There is not sufficient soil material to create poor drainage from this compaction.

This total cost would not be out of line for good land. However, an examination of the profile indicates about 90 percent rock (by volume) and a very small amount of soil material between the rocks. If you were to extract the soil material from a cubic foot of such land, the more choice spots would produce one cup of dry soil material. Hence, heavy fertilization is necessary to grow profitable crops. Takao

Raking debris following knockdown by bulldozer on Aa rainforest.



Young coffee and papaya trees on Aa land.





Niiya, manager of Farmers, Ltd., which produces coffee and papaya, applies about 3,000 pounds of 10-10-10 fertilizer per acre annually on the papaya. This is applied at the rate of nearly 400 pounds per acre eight times a year.

The problems of mulching, crop-residue utilization, and windbreaks are also serious. Obviously, one very important step is to increase, or at least maintain, the organic matter between the rocks for more efficient response to fertilizer. Windbreaks are used principally for plant protection as coffee, papaya, and the Macadamia nut can tolerate very little wind.

While this area receives 90 inches annual rainfall, occasionally the distribution is such that small, newly started plants may suffer from a lack of water. In an effort to combat such setbacks, Mr. Niiya recently asked SCS technicians to work with him on determining the cost of developing a supplemental irrigation system on this land.

Another big problem in this rock farming program is that it takes too long to get old lava flows in production. The way things were going until recently, several hundred years passed before organic matter formed and erosion broke down the lava beds.

Richard Lyman, agriculturalist and a director of the Puna district, started some tests on farming new lava beds, a few years ago. He believes his lava test plantings show that man can get the jump on Nature by hundreds of years by putting fresh lava in production soon after it cools.

Lyman started his nursery plantings in a small lava patch along the highway between the cities of Pahoa and Kapoho on Hawaii a year after Mauna Loa's last volcanic eruption in 1955. He used a spike or rooter to loosen the Aa soil, bulldozed to flatten and crush the soft, lumpy clinkers, then rolled the patch to pulverize and smooth it down.

In Aa, he picks out a foot square, foot deep hole for each planting. If lava isn't broken down enough, he adds a little soil so roots can take hold. In planting Pahoehoe, a smooth, solid lava, it's usually necessary to set holes with a drill or jackhammer.

Lyman fertilizes each planting, using a rule-of-thumb application of a pound of complete fertilizer for every inch of diameter of the plant. This treatment is a must in rock farm-

ing and is repeated four to six times a year to feed plants and offset leaching from the 80- to 100-inch annual rainfall.

The roadside plantings were made in 1956, right after the lava cooled, and included hala (screw pine), monkey pod (the rain tree), watermelon, plumeriagrass, pangolagrass, and others. As is the practice in rock farming, Lyman spread cane mulch or bagasse (crushed sugarcane stalks) around each hole to save moisture.

All of the plantings flourished and the watermelon grew two fruits. A lime tree seedling, which normally takes 4 to 5 years to bear, produced fruit in new lava in 2 years. And a planting of papaya, made in the fall of 1956, was judged commercially successful after a year's growth. Fruit is of normal size but not as soft as papaya produced by commercial growers, which Lyman says enhances its value.

One of his latest experiments with Aa farming was a seeding of corn, tomatoes, and other garden crops in 8 inches of topsoil spread over fresh lava. Results were only fair because of dry weather.

Does fresh lava stimulate plant growth?

Lyman thinks not. He says, "Until lava is weathered, eroded, and mixed with organic matter, it doesn't put out enough nitrogen, potash, and phosphate to feed plants.

Lyman tells visitors to his nursery, "It's too early to say how much production we'll get from fresh lava and we're not sure if it will pay to make large-scale plantings under these conditions.

"We do believe we have proved that farmers don't have to wait for Nature to change lava into topsoil. They can do it well enough with a dozer and roller in a few days to give plants growing room. The books have been telling us to let erosion do the job.

What has been considered wasteland for many years may hold the key to increased production in Hawaii. While the Island of Hawaii is the only island of the chain having any amount of this type of land, it has a large acreage. The Puna Soil Conservation District has at least 200,000 acres of such land. Although it presents problems in management, as does most other land, crops can be produced to help the economy of the State.

# WHAT PRICE WATER?

*Hawaiian farmers construct asphalt plank-lined reservoirs for storage of irrigation water.*

By MERLE H. ARNOLD, JR.

WHEN Yoshio Inouye built his first asphalt plank-lined reservoir in late 1957, little did he realize he was starting a trend—a trend in better water management, improved irrigation water distribution systems, and increased crop production for his community. Within the next 18 months, 24 similar reservoirs had been built in his district, the Olinda-Kula Soil Conservation District, and one in the West Maui Soil Conservation District, both on the Island of Maui, Hawaii.

The 26 reservoirs impound over 4 million gallons of water. They have been constructed with cost-sharing from the Agricultural Conservation Program and technical assistance from the Soil Conservation Service. Many more reservoirs are planned under the 1959 program.

Most of the Kula district is unique—even for Hawaii. The forest soils are high in fertility and are highly erodible when cultivated. The Kula Area lies between 2,000 and 4,000 feet in elevation and land slopes are steep, averaging about 15 percent. The climate is cool and the rainfall is relatively low, ranging from 20 to 50 inches annually. Temperate zone crops are raised, but production is limited by water. The irrigation water supply is from the Kula pipeline, which is primarily a domestic water supply system.

In times of drought, little water is available for irrigation. However, the water that is



Reservoirs are dug with a bulldozer, soil piled around the edges, leveled and smoothed. No sharp, cutting rocks are left protruding on the surface.

available can be put to more efficient use by accumulating a supply in a reservoir and irrigating from it. Water is generally applied to the land through sprinkler systems. Both water and labor are saved when a reservoir is installed and used.

The reservoirs were designed for two major purposes: to combat the water shortage at critical times during drought periods, and to assist the technicians, assigned to the district, design more efficient irrigation systems with constant pressures and quantities of water rather than the former inefficient systems with fluctuating pressures and amounts of water.

Asphalt planks, 1/2-inch thick, are laid and sealed with a strip of asphalt to make the reservoirs watertight.



Note:—The author is soil conservation aid, Soil Conservation Service, Wailuku, Maui, Hawaii.





Water reservoir lined with plank-type asphalt membrane, at a higher elevation than the fields to be irrigated.

Other important functions of the reservoirs are fire protection and emergency waters in case of line breaks or extremely low pressure periods.

It is necessary to line all reservoirs constructed in these soils, as most Hawaiian soils have high infiltration rates. The rates vary from less than 1 inch per hour to more than 20 inches per hour.

Asphalt-plank lining is the type that has generally been installed in Kula. Other types, including hot applied buried asphalt and shotcrete (thin concrete applied with a spray gun), have also been used in Hawaii.

The 1½-inch thick asphalt-plank material has found favor because of ease in handling and ease of installation—inexperienced help can install it with little difficulty.

The reservoirs have performed satisfactorily to date. Little or no seepage loss is apparent and evaporation losses are low in the Kula district.

Contrary to the general practice prevalent on the United States mainland, where ponds are usually constructed in gullies and filled by surface runoff, reservoirs on Maui are seldom built in gullies.

Sites for the reservoirs are generally selected by SCS technicians assigned to the district. Location factors include stoniness of soil and

underlying rock and elevation with respect to fields. Most of the reservoirs are installed on the higher land of the farm. Sometimes they are located lower because of excessive costs of excavation. For some reservoirs, blasting has been necessary.

In one case the farmer's choice of location was in a dry gulch. Little or no water had been carried down the gulch for 15 or 20 years because water is diverted by the highway above. However, the gulch sites are generally avoided in favor of the higher location sites.

Strange as it may seem to mainland readers, out here in the middle of the Pacific there are lands which can become quite arid, within sight of a vast ocean, and where irrigation water is in great demand. Sort of reminds us of Coleridge's "The Rhyme of the Ancient Mariner"—"Water, water everywhere, but not a drop to drink," except in this case it is sometimes "Not a drop to irrigate."



Drake University summer class of 35 teachers conducted all 22 activities described in **TEACHING SOIL AND WATER CONSERVATION—A CLASSROOM AND FIELD GUIDE**, SCS publication available to teachers. Report on effectiveness of the activities is being prepared by the class.

# The Greene District of Ohio

## *Supervisors and SCS Technicians Each Accept Own Responsibilities and Speed Up Progress of Conservation.*

By W. H. LATHROP

**"I**'VE heard about our district program and how we won the Goodyear award. I've seen the work on my neighbor's farms. I want to take part in it."

That's Sam Harshman talking. He operates a 300-acre farm in the Greene Soil Conservation District in Ohio. There's nothing unusual about what Sam said. What is unusual is that 52 farmers who became cooperators with the district last year did so with the same spontaneous enthusiasm, mostly by coming to the office and leaving signed agreements with the district secretary.

Cooperative agreements between the district and the farmer are sometimes obtained only at the expense of a great deal of "supporting" activity by the SCS work unit staff. But the Greene district is rated one of the highest in the State in percent of time spent on direct technical assistance. "I didn't help in any way with the district's annual report last year," said Work Unit Conservationist David Kile. "Chairman Billy Gerard asked Robert L. Thomas to get it out, which he did. I didn't see it until it was finished."

Even the briefest review of all the Green district's activities described in the 1958 report would make this account too long. It tells of the cooperation and activities of nearly a hundred agencies and individual leaders. The board carried out 17 major activities which were scheduled at the beginning of the year. They include tours, field days, contests, forums, and exhibits. The 1959 schedule shows 30 dates on which contests, banquets, meetings, and other events will take place. The Green district is the only district in the State ever to win the Goodyear Award twice.

Note:—The author is information specialist, Soil Conservation Service, Milwaukee, Wis.

What is the source of the leadership which makes all these accomplishments possible? Kile credits much of it to a series of area meetings for supervisors started 10 years ago at the suggestion of SCS Area Conservationist Dan Buskirk. Buskirk had observed that so-called "natural leaders" among district supervisors were not always active leaders to start with. Farmers can learn leadership, he believed. The area meetings have proved that he was right.

Two or three meetings for supervisors in the eight-district area are held each year. District responsibilities, relations with other agencies, and the Memorandum of Understanding with the SCS are discussed. Floyd Heft, executive secretary of the State Federation of Districts, and Ray Brown, SCS State conservationist, have taken active parts in the meetings. But the supervisors don't only listen to speeches. At the February 1959 meeting, each board member made a talk on the responsibilities of the district board members and committee chairman.

With the Greene district board actively carrying on its program, Kile is careful not to encroach on district responsibilities. He refers all district business to the chairman. "When I attend a meeting where district business may come up, I arrange to have a board member there," he says. "I try to confine my work to furnishing the best possible technical service to the district."

There is an official document on the office wall which shows that Kile and Conservation Aid Thomas Ernstes are doing just that. It's a Certificate of Merit awarded Kile and Ernstes jointly, "For superior performance which led to high production in the Green Soil Conservation District."



A Future Farmers of America soil conservation contest in the Clarendon Soil Conservation District, South Carolina, resulted in the district receiving 89 requests for help with conservation farm plans.



# LEARNING BY DOING

## VO-AG BOYS FIND THEIR OWN ANSWER TO CONSERVATION FARMING

By HAROLD F. RYAN

**T**HERE is no point in using a blackboard for teaching when you have the whole outdoors for a classroom. That is the way Arthur Weiner, Vo-Ag instructor, looks at the job of teaching soil and water conservation at West Bend High School in Wisconsin.

For example, several years ago one of Weiner's students came to class and remarked that some farmer surely must be crazy because he was laying out crooked strips across his farm. This seemed to amuse most of the class, but Weiner said, "Let's see how crazy this farmer really is." He immediately took the group in a school bus out to the field, where they spent the next 2 hours examining the farmer's stripcropped land.

Note:—The author is work unit conservationist, Soil Conservation Service, West Bend, Wis.

Using a soil auger, they made borings in the middle of the slope, finding only 4 to 5 inches of topsoil. Then they took borings at the base of the slope and found deposits of 15 to 16 inches of topsoil. This simple demonstration convinced the entire class that the farmer was using good judgment in establishing contour strips on his sloping fields.

There are many other examples of Weiner's direct approach. Four years ago, his students built their own tree planter because no tree planters were available in the county. As a result, tree planting increased from 8 acres in 1956 to 95 acres in 1959 on farms cooperating with the local soil conservation district.

Weiner persuaded the West Bend High School District to buy a rundown, sandy 55-acre farm near West Bend which the Vo-Ag students



Art Weiner points out evidence of erosion to his Vo-Ag students at a terracing demonstration.



have since planted to trees. The farm was placed in the Soil Bank and the school district collects an acreage payment each year.

Each spring and fall Weiner arranges for his classes to assist with the actual layout of conservation practices, such as waterways, contour stripcropping, and terracing on one of the students' farms. The work is done in cooperation with Soil Conservation Service technicians.

Correct use of land depends on knowing its opportunities and limitations, Weiner feels. His philosophy is that his students should be given as much training in land judging as possible to give them a better understanding of land capabilities. West Bend enters teams in state and national land judging contests each year. In 1957 they won the Wisconsin Vo-Ag Land Judging Contest.

Weiner also spearheaded land judging in southeastern Wisconsin by encouraging area land judging contests and getting other Vo-Ag teachers to participate.

Use of "live" examples and learning by doing pays off in added enthusiasm, Weiner thinks. His boys also come to realize that to be truly successful farmers, they must know and use conservation methods. There is no other way.



Arthur Wiener is a vocational-agriculture instructor who uses the outdoors as a teaching laboratory. His boys dig in the dirt and learn modern conservation methods by putting them into effect.



Aerial view of contour strips laid out by Vo-Ag students of West Bend High School.



## DISTRICT PROFILE

FRED E. ALLEN  
of  
NEW HAMPSHIRE

A man who raises eight fine sons on a New England farm in space-age America pretty well expresses thereby his faith in the future of soil and water. And the big, happy family at Alfarm, near the town of Durham, N. H., is no doubt Fred E. ("Doc") Allen's outstanding conservation project.

Along with what good-humored Doc describes as "pitching for my nine," he serves as chairman of the local soil conservation district and president of the State Association of Soil Conservation District Supervisors. His other duties as station veterinarian at the University of New Hampshire involving care of the University livestock, adviser to 25 to 30 pre-vet students, mastitis research, teaching, and manager of four small farms that furnish extra grass for hay for his own farm—make him one of the busiest men in Northeast agriculture. Active in community affairs, Doc is now serving his 13th year on the local school board.

His ability to keep activities constantly popping like firecrackers all around him made Doc the popular choice to lead the Granite State's SCD organization. Much sought after as a speaker for his dry, quiet wit, he has a unique way of impressing all farm groups with the vital importance of the task.

Frequently, he illustrates his points with anecdotes drawn from family experience. Take his method of rousing the boys in the morning; he posts a list of farm chores for the day. The first boy out of bed gets first choice; the second riser, second choice; the other boys, whatever jobs are left by the earlier risers. Naturally, the tardiest riser is likely to inherit the least agreeable chore.

"Somehow", says the Doc, "I think this could also apply to the soil conservation movement. We've got to move fast and smartly, or the job we'll get will not only be unpleasant—it will also be tragically late."

In Allen's own Strafford County SCD, they're closing in rapidly on the spreading "rurban"

problem. The key to it is a land-use-change study embracing trends in the past decade. The effect of sprawling roads, housing, shopping centers, drive-ins, and other impacts of the population-boom will be an eye-opener, Doc Allen believes. When fully revealed, he hopes it will spur action toward sounder controls of soil and water.

To do a better job of programing soil conservation, Allen and other leaders advocate stronger financial backing for the State Soil Conservation Committee. He also believes in close working relationships between district leaders and their technical advisers, the SCS men stationed in 10 county work units. He recommends ordinancing such land-use problems as topsoil removal and the digging of gravel pits. He feels the program should develop strong wildlife and recreation phases in appealing to cityfolk and owners of small properties.

The authoritative ring of Doc Allen's public utterances is no accident. He, Mrs. Allen, and the boys have run a vigorous conservation program at Alfarm for 12 years. Assisted by SCS planning, they've corrected wetness and multiplied productivity on 40 acres of grassland. The result is an excellent system of "machine-able" open drains and waterways.

They pushed juniper and rocks out of 6 acres and seeded a ladino hay-pasture. They removed stone walls to create one easily managed field

Fred E. Allen.



where once there were three difficult ones.

Doc and the boys have recently harvested 17,000 board feet of lumber by selective cutting. From this lumber, a 40 x 48 foot machinery storage shed was built by the Allens. They are now in the process of constructing a new barn for 32 milking cows. This barn will be ready for use in the fall of 1959. Milkers commonly number around 25, the majority of which are registered Holsteins although the Allens are aiming toward 30-plus. The herd has been outstanding for many years and last year was third from the top in the county, according to DHIA production records.

Mindful of a recent dry summer spent hauling barrels of water to the cattle, the Doc has a pond lined up for construction in the immediate future.

The future of soil conservation and his family both rank high in Doc's enthusiasm. While helping to plan the years ahead for his State's resources, he sees at the same time a bright horizon for his boys. Ranging in age from 4 to 23, three are presently in college—two headed toward engineering, one toward veterinary medicine. One lad in high school shows real interest in dirt—farming. Three are sprinkled through the elementary grades. The 4 year old is Mrs. Allen's constant man-around-the house.

"Since I'm a 'college prof', I suppose some folks thing I'm a hobby farmer," says Doc with a twinkle in his eye. "Usually, by the time I get through naming off the members of the Allen household they decide no man could make it a hobby with a brood like mine."

Farming, the Doc convinces his fellow Granite Staters, is a mighty serious business, and soil conservation even more so.

—FLOYD V. BARKER

Approximately 3.1 million acres were damaged by wind erosion in the Great Plains last winter and spring—0.6 million less than in 1957-58 and about one-third of that damaged in 1956-57.



The Utah State Land Board is cooperating with local soil conservation districts and the Soil Conservation Service in improving range management on State lands.



**GRASSLANDS.** By Howard B. Sprague. Illus. 424 pp. 1959. Pub. 53 American Association for the Advancement of Science. The Horn-Shafer Co.: Baltimore, Md. \$9.

AT the 1956 meeting of the American Association for the Advancement of Science, the program for Section O included a Symposium on Grassland in our National Life. This book contains 37 of the papers presented at this symposium.

The papers were prepared by well-known authorities in the United States who have a comprehensive knowledge of the various aspects of forages and their management. A list of references is also included for each paper. The information constitutes a detailed review of present knowledge, which should be helpful to people interested in the improvement and use of grasses and legumes in American agriculture.

Eight major subject matter aspects relating to grasses are included: Sciences in grassland research; production in the temperate humid regions; engineering; utilization and related nutrition problems; evaluation of the nutritive significance; climatology; ecology; and range management. Four or five papers are included in each of these major sections and present the latest knowledge of the many facets relating to the Nation's grasslands.

All of the articles should be of interest to agronomists and livestock men interested in the use and management of the nearly 800 million acres of grassland. Of special interest to conservationists are articles dealing with the use of grass in the humid regions and the management of the vast acreages of rangeland.

—B. D. BLAKELY

## Glass Fertilizers

Fertilizers made from glass are now being used in Florida to prevent rapid leaching from the soil, according to H. W. Winsor, assistant chemist with the Florida Experiment Station. Six of the minor elements (boron, copper, iron, manganese, molybdenum, and zinc) can be incorporated into a glass fertilizer containing silicates.



CHANGE OF ADDRESS SHOULD INCLUDE ZONE, OLD ADDRESS, AND CODE NUMBER

## HAWAII

(Continued from page 74)

The area of farm and in principal crops, in square miles: sugar—346, pineapple—120, grazing land—1,574, forest reserve land—1,875.

Since the economy of the islands is dependent mainly on the agriculture of sugar and pineapple, they provide the trade balance between imports and exports. Imports from the mainland amount to \$460 million and include; food (nearly two-thirds), raw materials, construction materials, clothing, appliances, cars, trucks, machinery, drugs, cigarettes, and other items. Foreign imports include fertilizers, newsprint, lumber, feed, and other products. Exports amount to \$251 million and include sugar, pineapple, coffee, canned fish, flowers and foliage, hides, fresh pineapple, papaya, and other products. The tourist trade helps compensate for the difference between imports and exports.

The area of the islands is 6,434 square miles or 4,119,227 acres, divided as follows, in acres: The Federal Government's military establishments—317,012; State of Hawaii—1,415,684; cities and county governments—10,809; private ownership—2,373,722.

In the general election on November 6, 1958, 88 percent of the eligible voters cast their ballots attesting to the civic consciousness of the people of the State of Hawaii.

—RUTH A. FRIES

I consider the soil conservation districts movement one of the most important developments in the whole history of agriculture. It has proved even more effective, I am convinced, than we had dared to expect.—Hugh Hammond Bennett in **THE HUGH BENNETT LECTURES**, published by Agricultural Foundation, Inc., North Carolina State College, Raleigh.

## Soil Conservation in the Rural Development Program

More efficient use of land resources is a partial answer to the fuller local utilization of unused human resources, the goal of the Rural Development Program, according to Chas. N. Shepardson, Member, Board of Governors of the Federal Reserve System.

In a talk before the West Virginia Bankers Association last summer, Governor Shepardson asserted that the problem is made up of "a series of local community problems, the solution of which depends primarily on local community action."

One of the opportunities for action, he suggested, is to put eroded cropland back into grass or timber. "This would not only help to maintain and rebuild the land but, in this day of widespread concern about domestic, industrial, and agricultural water supplies, it would go far in furthering a program of water conservation," he said.

Speaking of the Rural Development Program as a whole, Governor Shepardson said, "I can think of no previous program so directly oriented toward solving the basic problem of low income farm families and of the small towns and rural communities that are dependent on them for their existence."

More than 3,600 students in Natchitoches, La., saw soil conservation movies and heard a discussion of soil and water resources as a result of an educational drive spearheaded by Mrs. Samuel Levy, conservation chairman of the Louisiana Federated Women's Clubs of America.

Cooperating with the Bureau of Public Roads, SCS now includes a section on engineering properties of soils in soil survey reports.





**DECEMBER 1959**

# **Soil Conservation**

Soil Conservation Service • U. S. Department of Agriculture



# SOIL CONSERVATION

**EZRA TAFT BENSON**  
SECRETARY OF AGRICULTURE

**DONALD A. WILLIAMS**  
ADMINISTRATOR, SOIL CONSERVATION SERVICE

OFFICIAL ORGAN OF THE SOIL CONSERVATION SERVICE  
U. S. DEPARTMENT OF AGRICULTURE, WASHINGTON, D. C.

DECEMBER—1959

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TOM DALE, Editor

SOIL CONSERVATION is published by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business. The printing of this publication has been approved by the Bureau of the Budget, June 26, 1958. SOIL CONSERVATION supplies information for workers of the Department of Agriculture and others engaged in soil conservation.

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mailed to a single address.

"Yes, Virginia, there is a Santa Claus." He has many helpers . . . many assistant Santa Clauses.

The most generous Santa Claus in the world is the soil.

The soil gives us food, much of our clothing and houses and furniture, beautiful lawns, gardens and parks, and forests. It cradles the ponds and streams in which we swim, boat, and fish. It stores water we use in so many ways.

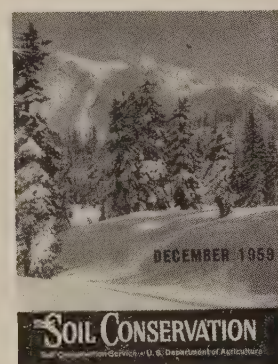
What would Christmas be without a little greenery, a bit of the outdoors, brought inside? The traditional Christmas tree, holly, or other symbols of life and cheer? Again we enjoy the bounty of the soil.

And what does the soil ask in return? How can we be "good children" to this Santa Claus?

All we need to do is keep the soil secure and in place . . . use it within its capability, treat it according to its needs, and protect it while we use it.

Yes, Virginia, there is a Santa Claus. It is the soil.

Merry Christmas.



**FRONT COVER.**—Snow surveyors who travel the snow survey course in the vicinity of 10,750-foot Mount Baker, Wash., have their own natural Christmas trees.

—Photo by Byron Moser

All orders go to the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

*Conservation plays a part in spreading*

# Christmas Cheer

By LESTER FOX

Each Christmas soil and water conservation helps bring a gala package of colorful holly sprigs from Millville, N. J., to a lot of people throughout the United States.

The holly is grown in a large orchard conceived and maintained by Clarence R. Wolf, founder and the first long-time president of the Holly Society of America, Inc. In operation of the orchard, soil and water conservation plays a major part. Without it there would be little quality holly.

Wolf started a silica sand company in 1921 when he was principal of the Millville High School. Grateful for the patronage that he quickly built up, he started sending a Christmas remembrance to his customers as a token of appreciation. But he wanted something distinctive and especially something that would convey the true Christmas spirit. He had observed the holly trees growing wild in the woodland adjoining his plant, and noticed his workers cutting sprigs to take home at Christmas time. Symbol of hope and joy, holly was just the thing, he concluded.

So in 1926 Wolf sent 46 boxes of holly sprigs to industrial clients. The response was overwhelming. Nearly everyone went to the trouble of writing Wolf to tell him of the pleasure the holly had brought. Some hinted broadly that they would like nothing better than a similar package the next Christmas.

Since then the number of packages has increased to 2,200 boxes a year. Each package

contains 25 holly sprigs and a boutonniere. The 2,200 boxes represent about 17,600 pounds of holly.

It wasn't long before the native woodland was hard pressed to produce enough quality holly to meet the demand. So in 1939 Wolf started his holly orchard. Workers at the sand plant, most of whom are farmers because of Wolf's preference, set out 40 acres of seedlings from the woodland and a few bought from nurseries. Six years ago Wolf put out 1,600 new trees of improved species and varieties developed by Daniel G. Fenton. They cover 18



Note:—The author is information specialist, Soil Conservation Service, Upper Darby, Pa.

Miss Betty Jane Peterson cuts sprigs of red-berried holly in Clarence R. Wolf orchard.



acres. The orchard had become so big and was so much in need of continuous attention that Fenton was employed as manager in 1945. He has a year-round staff of three men and calls on plant workers when he needs more help.

Fenton quickly saw the need of a soil and water conservation program to prevent erosion of the Galestown sand and the Pocomoke sandy loam soils of the orchard. It was needed to get top production of quality holly.

The conservation program consists of many dove-tailing practices. Fenton keeps the soil covered with ryegrass and ladino clover to prevent wind and water erosion. He's looking for a clover that can take heavy traffic. When he

mows the clover, he leaves the clippings to add organic matter to the soil. A tile drainage system keeps excess water off the land. Mulching, pruning, and fertilizing lightly with chicken manure and 500 pounds of 5-10-5 an acre each spring are a part of the conservation plan.

Fenton irrigates young trees until they are 3 years old. While the holly trees have not been affected by disease, they do fall prey to insects. So Fenton sprays them regularly.

When Fenton put out the new 18-acre orchard 6 years ago, he was careful to preserve soil values. In clearing scrub oaks and pines, he used a bulldozer with a front rake. The rake cleared the trees without covering or removing the topsoil. He then planted soil-improving rye and ryegrass. In the spring he turned the crop under, manured the soil heavily, cultivated, and planted holly trees. Then he seeded a cover crop.

With this kind of conservative care, the orchard is a high producer.

It's not uncommon to cut from 70 to 80 pounds of holly sprigs from one tree after it gets to be 15 years old," Fenton said.

It would seem like an expensive proposition to maintain a holly orchard just to provide Christmas cheer. But Wolf says: "You can't put a price on goodwill." He agrees that you can't put a price on soil and water conservation either.



Below: Orchard Manager Daniel G. Fenton (left) and SCS Technician James S. Wasson discuss ground cover in holly orchard. Left: One of three revolving wind towers which help prevent frost damage.





# Merry Christmas—Year-round Job

*Christmas trees important part of Ohio farmer's conservation program*

By LEO CLARK

Planting a quarter million trees in 10 years is a big job on any farm. That is what Roy Masterson of Sayre, Ohio, has done and he is continuing to plant about 25,000 a year. He likes Christmas trees, found them the solution to his erosion problem, and has developed a good woodland business.

Masterson, full-time farmer and past member of the Perry Soil Conservation District board of supervisors, operates more than a thousand acres in Perry and Morgan Counties.

This large operation didn't come about overnight. It started in 1946 when Masterson determined to do something about the eroded hillsides about him.

"I became interested in the woodland program because of the Soil Conservation Service technicians and our county Extension agent," Masterson said. "The SCS men pointed out that trees were the best use for these eroded upland acid soils."

Masterson became a cooperator with the Perry Soil Conservation District in 1946. The district sent an SCS technician to help him

develop a complete farm plan. As he purchased new land he has revised the plan. Poplar, yellow locust, walnut, ash, and mixed pines were planted the first few years. Today, some of the best species of hardwoods and pines are in evidence in his plantations.

Masterson also gave attention to ponds and wildlife plantings. He has planted more than 100 rods of multiflora rose fence and built four farm ponds. He plans to build another one as soon as he can locate suitable sites in the proper places.

In addition to the tree business, Masterson has a fourth of his land in rotation crops with a livestock program which helps improve the soil fertility.

Masterson accomplished his tree planting program with the help of mechanical tree planters and a tractor. Last year he planted 50,000 trees.

Trees being his "first love," Masterson spends a lot of time following the tree planter in the spring, frequently tramping around the trees and pulling them up a little so the roots won't be crowded or bent. Over the past 10 years, survival has been 90 percent or better.

Note:—The author is soil conservation aid, Soil Conservation Service, Somerset, Ohio.

**Tractor-drawn planting machine enabled Roy Masterson to plant a quarter million trees in 10 years.**



**Roy Masterson prunes some of his white pine to develop better shaped Christmas trees.**





Masterson has developed both a retail and wholesale market for Christmas trees. He operates three large Christmas tree lots in Columbus, Ohio, and sells thousands on the stump. He supervises any cutting done on the farm so that a good timber stand will remain. He markets pulpwood during the winter.

Masterson is following a good conservation program on all his woodland fields. Improvement cuttings used for pulpwood and Christmas trees, provide some income each year.

"It is extremely important," Masterson said, "to have good roadways through the pine plantations. These serve as firebreaks and let firetrucks and spray equipment into the area. They also provide a way to haul out timber products. We spray for European pine shoot moth and tip moth repeating the treatment when new infestation is noticed."

Certain species of Scotch pines have a yellowish cast, making them unsuitable for Christmas trees. So attention is given to purchasing the proper strain in order to get the true green color and insure a saleable tree.

Masterson clears brush and sprays stumps with brush killer a year before he starts planting trees. Grass and small brush must be con-

trolled where it is a problem. This is done with a rotary mower several times during the growing season. Many trees to be harvested for Christmas sales are shaped and pruned in late May or early June. Some of them can be sold that year but others need shaping the following year.

"It pays to keep the cost of machinery and labor in the woodland as low as possible to insure a yearly net income," he said. "But foresters and farmers working with trees are well aware that there is more in life than dollars and cents."

His good woodland management caused Robert Paton, forester with the Ohio Forestry Association to recommend the Masterson farm for recognition as an Ohio Tree Farm in 1957. In making this award to Masterson, William Laybourne, secretary-manager of the association, said: "This farm is one of the best examples of woodland management in Ohio."

Masterson is a charter member of the Ohio Christmas Tree Growers Association. His farm, in the past years, has been the scene of many forestry days and educational tours for both high school and adult groups.

## Farmers, hunters, land, and wildlife all benefit from

# Farming for Waterfowl

Significant progress in improving private lands for waterfowl in the Southeast and Pacific Coast States promises more wintering habitat for ducks, geese, and other water birds, improved facilities to meet increased hunter's demands, and an economic return to farmers and ranchers.

Farming for waterfowl—a new term describing modern farm technologies used in the development and management of tillable lands for annual production of a dependable, high-quality food crop for waterfowl—is replacing the hit or miss methods often used in the past. The new techniques include careful site selection, use of adapted plant species, seedbed preparation, proper seeding, and fertilization, as well as irrigation, improved drainage, and

other methods of water-level control.

Such work usually is on diked areas where food plants include barnyardgrass, common sudangrass, browntopmillet, and smartweeds. Where field corn may be grown, it often is used on higher capability lands. Farmers flood these areas in fall and winter by pumping, stream or reservoir diversion, or seasonal rains, making seed of the planted grasses available to the waterfowl. Some farming for waterfowl in soil conservation districts is on privately-owned or leased lands of organized duck clubs.

California alone has more than 800 clubs controlling 200,000 acres of land operated primarily for waterfowl shooting, but where livestock production or another farm enterprise may be a secondary land use.

## Agencies team up to help ranchers get

# Good Grass

By HERB BODDY

**G**OOD grass growth that C. O. Bankhead and son Armand got by whipping a tough alkali condition on their wet lands near Bethany in San Joaquin County, Calif., shows what farmers can gain by giving today's tested soil and water conservation tools a trial.

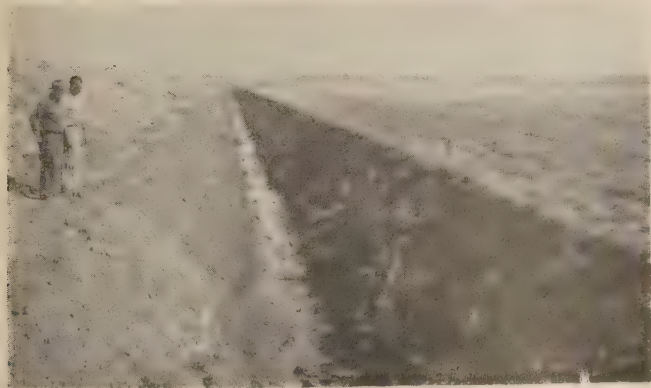
The Bankheads' success in getting grass to grow on alkaline, salty acres called for giving their land the full conservation treatment, including drainage, land leveling, relocation of irrigation borders, and reseeding to improved grasses and legumes plus proper grazing use.

All this work was carried out with help from Soil Conservation Service technicians, Agricultural Research Service specialists, and the Agricultural Conservation Program through the Eastern Alameda County Soil Conservation District. The work paid off well. Grass was more than doubled on the worst alkali areas. On other treated acres growth was high and lush the first year.

Several years ago the Bankheads looked around for an irrigated ranch to go with their hill ranches in the production of hay, grain, and livestock. Because of the reasonable cost of water and land, they chose the 450-acre Bethany place close to their hill holdings.

Note:—The author is information specialist, Soil Conservation Service, Berkeley, Calif.

One of main ditches that carries excess water to sump on Bankhead ranch.



Says Armand Bankhead, "The new ranch met our needs, but it had some tough soil and water problems. Our land lay behind dikes along the San Joaquin River and there was no outlet for drainage water. The situation resulted in a high water table and concentration of salts and alkali on portions of the ranch lands."

There was a lot of alkali on 200 acres and the rest of the land was fairly salty. Irrigation runoff and subsurface drainage from higher areas gave the farm a high water table.

Arthur Carns of the Livermore Soil Conservation Service office, who helped the Bankheads work out things with help from the Agricultural Research Service and Agricultural Conservation Program, tells how the water and grass problems were whipped.

Says Carns, "We work with a good many farmers in Alameda and San Joaquin Counties who have alkali and water troubles like the Bankheads. There's a lot of subsurface water seeping into valley lands from the hills. You have to drain this water if you want to make a go of farming.

"When we checked the drainage system we found a  $\frac{3}{4}$ -mile long ditch on the north side of the farm, which was far too shallow.

Armand Bankhead (right) and A. G. Carns inspect sump used to pump water over levee into San Joaquin River.







C. O. Bankhead (left) and Armand Bankhead check their conservation ranch plan with SCS Technician A. G. Carns (center) in newly established pasture.

"We helped the Bankheads stake a total of 15,000 feet of new ditches and enlarge 8,000 feet of old ditches. The improved ditches are 20 feet across the top, 4 feet wide at the bottom, and have an average depth of 7 feet.

"These main disposal ditches were installed over a 3-year period with dragline equipment at a cost of \$6,000, about half of which was refunded under the ACP cost-sharing program.

"The job of these disposal ditches is to carry water to a sump where it can be pumped over the dike to the San Joaquin River."

Field investigations carried out under Dean C. Muckel of ARS tie in with technical assistance given the Bankheads by SCS. ARS installed a water-stage recorder and flume to measure water in one of the ditches. ARS specialists take periodic water samples at the flume and from auger borings in irrigated fields. Soil samples also are taken in fields and a close check is kept on salt content.

The measuring flume shows that water drained from about 90 acres at the start of the

irrigation season (1958 had an abnormally wet winter) amounted to 200 gallons per minute. Each irrigation increases drainage in ditches by about 175 gallons per minute, showing that the ditch system is working well and that excess ground water and salt is being removed from fields.

One flume showed more than 400 tons of salt were drained from one main ditch from March to October last year.

Not long ago, Armand said, "We've gotten some surprising results from our drainage work. We worked over 90 acres in 1957, smoothed them up and changed the direction and location of borders. Then in the fall we seeded them to an improved mixture of grasses and legumes. In the spring of 1958 the seeding looked good and we grazed it lightly all last year. The field had a beautiful stand last spring. Drainage made our pastures better producers and we can now grow more and better alfalfa.

"We plan to take 200 acres, or about half of our ranch, out of poor-rough pasture and plant it to asparagus in the spring of 1960. Asparagus wouldn't grow when the land was wet and salty.

"On some of the worst alkali land we drained, grass is coming back with no other treatment."

Borings were made on some of the worst alkali spots in mid-March and no free water was found at 5-foot depths.

The Bankheads aim to treat the rest of their acreage so that it will produce like their top 90.

Two of the Bankhead's neighbors, Bill Ralph and Fred Draper, are now carrying out the same kind of drainage work.

## Great Plains Land Ownership

Concentration of ownership of rural land in 10 Great Plains States, containing 47 percent of the farm and ranch land in the U. S., did not change appreciably between 1954-58, a USDA survey shows. Although there were fewer owners and the average size of ownership unit was increased, the proportion of land held by both small and large holders was about the same in 1958 as in 1945.

The proportions of rural land in public and private ownership vary considerably in the 10 States with private ownership averaging 75 percent.

# Progress In Watersheds

*For conservation and flood prevention*

By CHARLES H. LLOYD

Fiscal year progress reports for Pilot and Public Law 566 Watershed Projects and Flood Prevention Watershed Projects are full of statements that tend to forecast a highly successful future for the watershed programs with which the U. S. Department of Agriculture is helping local organizations and landowners.

Local organizations throughout the country by October 1, 1959, had submitted 1,204 applications for assistance under P. L. 566. The applications covered more than 86 million acres.

Planning help by SCS technicians had been approved for 498 of those applications. Federal assistance in the installation of measures planned for the projects had been approved for 209 small watersheds covering 12,412,000 acres.

Note:—The author is soil conservationist, watershed planning division, Soil Conservation Service, Washington, D. C.

A reviewer of these reports is impressed by many things but most of all by: Actions taken by sponsoring organizations to overcome a variety of problems; the high degree of acceptance of responsibilities by capable local leaders; and, the effectiveness of completed and partially completed projects under severe tests.

The performance and accomplishments of local leaders are so outstanding that it is difficult to select and summarize examples from the reports that will adequately reflect the progress being made in watershed projects.

But the effort has been made. On the following pages are examples that seem to be representative, summarized under four major headings: Easements and Finances; Land Treatment Progress; Structural Measures; and How Well Do They Work?

Snowcapped mountains make beautiful scenery and provide water for many purposes but may also start floods. This is the Collegiate Range above the Arkansas River Valley near Buena Vista, Colo.







# Easements And Finances

Many and varied problems are encountered by local sponsoring organizations in providing land easements and rights-of-way and in sharing the cost of structural measures for water management in watershed projects. Action taken to overcome them emphasizes the high quality of local leadership.

Following are examples of how local organizations are handling this phase of the watershed job, as reported in fiscal year summaries. Unless otherwise indicated they are Public Law 566 projects.

## Arkansas

Flat Creek, Lawrence County: The Arkansas Game and Fish Commission acquired more than 900 acres required for a multiple-purpose structure at a cost of about \$100,000. This structure was scheduled for construction during the first year of the installation period. Easements were complete for a floodwater retarding structure, also scheduled for first year construction. Four additional easements had been signed on other structure sites.

The Arkansas Highway Department was preparing plans to relocate 1.1 miles of Arkansas Highway No. 25 to permit construction of the multiple-purpose structure.

The Flat Creek Watershed Improvement District was created in Chancery Court and the commissioners appointed. This district will levy taxes to raise funds for the local share of installation costs and for operation and maintenance of the works of improvement. The Game and Fish Commission will operate and maintain the multiple-purpose structure and the 4.6 miles of diversion.

## Alabama

Hightower Creek, Towns County: Easements and rights-of-way valued at \$8,822 had been obtained from 63 landowners. This work was done by a committee composed of E. R. Eller, farmer and Hightower Creek Watershed Association president; Sanford Berrong,

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**EDITOR'S NOTE:** Annual progress reports on watershed protection and flood prevention projects are used in many ways. They also provide the basis for this roundup story—selected thumbnail sketches of what's going on in a few places across the country. Also see the story about the Washita River project which follows this article. More information about the P. L. 566 program may be obtained in two publications available from your nearest SCS office: "Small Watershed Projects Under the Watershed Protection and Flood Prevention Act" and "Local-State-Federal Watershed Projects."

farmer and watershed association vice president; H. Jack Eller, farmer and watershed association secretary and treasurer; Bert J. Eller, R. M. Kimsey, R. L. Anderson, J. C. Coleman, and G. C. Rogers, all farmers and watershed association directors.

The easements and rights-of-way cover all structural works of improvement. Local landowners spent an additional \$800 in obtaining easements for moving a house and power poles.

## Indiana

Elk Creek, Washington County: The Elk Creek Conservancy District was assigned the task of obtaining easements and rights-of-way by the Washington County Soil Conservation District. All easements and rights-of-way for all channel and drainage work were donated.

Only three easements remained to be obtained above two structures. The landowners were willing to grant easements but some question arose as to whether a change in site might be feasible. The conservancy district has the right of eminent domain under State law and the directors said they would use this power if necessary.

## Kansas

Switzler Creek, Osage County (Pilot project): Easements had been obtained for three completed structures and for the structure scheduled for construction in fiscal year 1960. The Osage County Soil Conservation District board of supervisors obtained the easements. Additional easements needed for the remaining multiple-use structure were to be obtained by the City of Burlingame.

## Louisiana

Bayou Dupont, Natchitoches, and Sabine Parishes: Of 218 easements valued at \$158,000 needed for 22 structures, 203 easements had been signed. This work was done by a committee consisting of Marshall Winn, chairman of the sponsoring district; Ott Williams, chairman of the neighboring district; Robert Jackson, former tax assessor; John Luster, businessman, and several local farmers. All easements were cleared on 14 reservoir sites.

## Mississippi

Ellison Creek, Yazoo County: The Ellison Creek Watershed Drainage District applied for a Farmers Home Administration loan for \$52,000 to cover the

local share of construction cost, easements and rights-of-way, and administrative costs. All easements and rights-of-way were to be obtained by court decree. The watershed drainage district will pay \$150 per acre for land covered by water in the permanent pools of the four structures.

## Missouri

Platte River Tributaries, Worth County: Easements and rights-of-way valued at \$7,500 had been obtained from 19 landowners. All easements and rights-of-way had been obtained for 12 of the 13 structural measure sites. One easement and right-of-way were to be obtained. This work was done by Carl Hiatt, district chairman; C. R. Streeter, Sheridan banker and watershed trustee; Carl Winemiller, farmer and watershed trustee; Art Scott, farmer and watershed trustee; Luther Cook, implement dealer; and Bob Holland, oil distributor.

## North Dakota

Elm River, Traill, Steel, and Cass Counties: Easements had been obtained for one floodway and were being obtained for four others. The Traill County Water Conservation and Flood Control District is responsible for obtaining easements and rights-of-way. It has sufficient money on hand or is able to raise the necessary revenue through taxation to obtain the rights-of-way needed. It has the right of eminent domain and has indicated that it will use it if necessary.

## Oklahoma

Big Wewoka Creek, Seminole, Hughes, and Pottawatomie Counties: Seventy percent of all easements and rights-of-way had been obtained from 146 landowners at a value of \$429,250. The four principal cities in the two watershed projects, Wewoka, Seminole, Holden-

ville, and Wetumka, furnished \$34,300 to establish and operate the conservancy office until operating funds are obtained from assessments on benefited land.

Seminole and Hughes County Soil Conservation District supervisors had obtained about \$7,000 from the Oklahoma State Soil Conservation Board revolving fund, to be used in obtaining easements and rights-of-way at five locations.

## Oregon

Lynx Hollow, Lane County: Easements had been acquired along the old Lynx Hollow channel at no cost. Rights-of-way valued at approximately \$18 000 (including the outright purchase of one entire property) had been or were to be acquired by the Creswell Water Control District along the proposed diversion channel.

## South Carolina

Brushy Creek, Anderson and Pickins Counties: Easements and rights-of-way are valued at \$29,451. Of the 43 easements and rights-of-way needed for the 4 floodwater retarding structures, 30 have been obtained. This work was done largely by District Supervisor R. T. Tripp assisted by the Brushy Creek Watershed Board of Directors and other farmers within the watershed.

## Tennessee

Jennings Creek, Jackson, Macon, and Clay Counties: Funds for the acquisition of easements and rights-of-way will be raised by assessment on the flood plain land benefited by the structural measures. Procedures under the Tennessee Watershed District Act, as a step in making assessments, were started. Application for a loan was made to the Farmers Home Administration. It was estimated that easements and rights-of-way for the five structures planned for construction in fiscal year 1960 would be available by February 1960.

Common Bermudagrass cover prevents erosion on earth dam in Green Creek Pilot Watershed Project, Earth County, Texas.



Detention dam helps prevent floods and provides fishing, stockwater, and waterfowl habitat, Scott Creek Pilot Watershed, Union County, S. Dak.







# Land Treatment Progress

The more rapid application of conservation measures by individual landowners and operators reflects the determined efforts of sponsoring local organizations to keep land treatment work ahead of construction in watershed projects. The successful ones enlist all available help from every possible source. Their efforts are positive and productive. Following are examples of progress in land treatment taken from the fiscal year summaries. Unless otherwise indicated, they are Public Law 566 projects.

## Kansas

Little Delaware Mission Creek, Brown County (Pilot project): Over 70 percent of the needed land treatment measures were applied. Estimated total cost of all needed treatment measures is \$362,200. Basic conservation farm plans were completed on 92 percent of the farms.

Conservation treatment was completed on 22 percent of the farms. Of the needed 690 miles of terraces, 410 miles were constructed, and of the needed 1,000 acres of waterways, 850 were established.

## Alabama

High Pine Creek, Chambers and Randolph Counties: Of the 385 farmers in the watershed, 213 were co-operators of the Piedmont Soil Conservation District. Of the cooperatives, 181 had basic conservation plans. On the 2 construction units approved, more than 60 percent of the land was under agreement and about 75 percent of the planned practices applied. On the third construction unit, 40 percent was under plan and 60 percent of the planned practices applied.

## Arkansas

Caney Creek, Cross County: Installation of land treatment measures, estimated to cost \$237,000, was ahead of schedule. Of the 256 farmers in the watershed, 187 were soil conservation district cooperators. Sixty-five percent had basic conservation farm plans. More than 50 percent of the planned land treatment measures were applied. All land treatment measures were completed on 31 farms totaling 2,740 acres.

The Forest Service and the Arkansas Forestry Commission supervised the planting of 175 acres of pine seedlings for watershed protection and 18 acres of seedlings for critical area stabilization.

## Indiana

Elk Creek, Washington County: Slightly less than half of the landowners were soil conservation district

cooperators, but 58 percent of the land was under district agreements. Many tracts of 20 to 40 acres of timbered land are owned by absentee landlords, several outside the State. Since these lands are not grazed and the timber not harvested, they do not represent a hazard.

Of the 387 acres of contouring planned, 322 acres were applied; of the 5 miles of terracing planned, 4.3 miles were constructed; of the 630 acres of pasture establishment planned, 246 acres were applied. The estimated cost of land treatment measures is \$145,931.

## Kentucky

Cypress Creek, Union County: Application of land treatment measures was ahead of schedule. Of the 185 farmers in the watershed, 163 were soil conservation district cooperators, and 122 of them had basic conservation farm plans. Conservation practices were established by 123 district cooperators during the year.

The practices included: 1,647 acres of conservation cropping systems; 1,071 acres of cover crops; 1,605 acres under crop residue management; 585 acres of pasture planting; 538 acres of pasture improvement; 247 rods of multiflora rose fence; 49 acres of wildlife area treatment; 1.4 miles of diversion channel; 29 acres of waterway development; 16,112 linear feet of channel improvement; 84,242 feet of tile drain; and 54 acres of gullied areas stabilized.

Approximately 65 percent of the needed land treatment measures were applied in the watershed.

## Maryland

Little Deer Creek, Hartford County: More than 75 percent of the planned land treatment measures were applied. Of the 93 farmers in the watershed, 58 were district cooperators and 44 had basic conservation farm plans. About 60 percent of the conservation measures needed on cropland were established. About 70 percent of the measures required on grasslands were established. Of the woodland measures, 60 percent of the tree planting and 86 percent of the woodland protection were completed.

To interest farmers in woodland management, the State's district forester established four demonstration plots of 1 acre each in the watershed. A pipeline area crossing the watershed was improved for wildlife by seeding Korean and sericea lespedeza where clearing was done through woodland.

## Nevada

Peavine Mountain, Washoe County: The planned land treatment measures were being applied on schedule. By

agreement with the landowners, the City of Reno assumed the responsibility for the land treatment work on privately owned land. Reno has an agreement with the Bureau of Land Management for the bureau to establish the land treatment measures on the privately owned land in addition to doing the work on Federal land.

Brush eradication was completed on approximately 1,100 acres. A contractor was constructing 8.5 miles of fence around the watershed. An additional 3-mile section of fence will be constructed later. The estimated cost of all land treatment is \$34,200.

## North Dakota

Elm River Watershed, Traill, Steele, and Cass Counties: More than 60 percent of the farmers in the watershed were soil conservation district cooperators. Of the 608 farms, 154 had basic conservation farm plans covering 80,000 acres. Soil surveys were completed on 2,560 acres this year. Of the 388 acres of trees needed in field shelterbelts, 186 acres were planted this year. Of the 312,000 cubic yards of earth moving needed to



The structural measures in watershed projects are generally dependent on the land treatment measures for protection. Their effectiveness, operation, and maintenance are in a large measure directly related to the protection given the land in the watershed by conservation land treatment measures. Structural measures therefore generally follow land treatment. Progress in installing structural measures is thus mostly in projects that have been underway for the longest time. Following are examples of progress in installing structural measures from the fiscal year summaries.

## West Virginia

Salem Fork of Ten Mile Creek, Harrison County (Pilot project): Seven floodwater retarding structures, one municipal reservoir (combination city water and flood control), and 2½ miles of channel improvement had been constructed. These measures costing about \$280,000 have a benefit-cost ratio of 1.5 to 1. The City of Salem paid the entire cost of the municipal reservoir.

## Illinois

Old Tom Creek, Warren and Henderson Counties (Pilot project): Thirty-nine floodwater and stabilizing structures and 2.6 miles of waterway improvement had been completed. The Warren County Highway Department provided part of the funds for the installation of a dual purpose structure to serve as a floodwater re-

improve individual water disposal systems, 50,000 cubic yards were moved in fiscal year 1959. Other practices applied include 22,335 acres of conservation crop rotations, 7,800 acres of cover cropping, and 300 acres of wind stripcropping.

Land treatment in the project area was given highest priority by the soil conservation districts. A conservation planner was assigned to the project this year to speed up the land treatment program. The total cost of the land treatment is estimated at \$525,000.

## South Dakota

Scott Creek, Union County, (Pilot project): Approximately 70 percent of the land treatment measures had been applied. Of the 24 farmers in the project, all but one were soil conservation district cooperators and had basic conservation farm plans. Conservation treatment was completed on 12 farms, containing 751 acres.

Of the 45 miles of terraces needed, 19.5 miles had been completed. Estimated cost of land treatment is \$87,545. ACP cost sharing assisted in this phase of work.

# Structural Measures

tarding structure and county roadway, replacing a bridge.

## Georgia

Little Tallapoosa River, Carroll and Haralson Counties (PL 566): Contracts had been let for 5 of the 14 floodwater retarding structures. These were in various stages of construction, from just starting, clearing and grubbing, to laying the pipe and concrete work. One additional structure was advertised for bids, and specifications were prepared for channel work below 5 structures. Contracts awarded were for less than government estimates. The Town of Temple, cosponsor of the project, will pay \$3,961 for municipal water storage included in one floodwater retarding structure.

## Nebraska

Brownell Creek, Otoe County (Pilot): Seven of the planned 9 floodwater retarding structures, 28 of the planned 39 stabilizing and sediment control structures, and two appurtenances to existing structures had been completed or were near completion. The total contract cost to date was \$220,890. Contracts were to be let for two additional floodwater retarding and 6 stabilizing and sediment control structures this fall, so that construction may be completed well before next June 30, the termination date of the installation period.



Five planned stabilizing and sediment control structures will not be installed because of unavailability of easements or lack of essential land treatment. Easements are available for all of the structures that will be contracted during this fiscal year. Estimated construction cost for the complete structural program is \$549,000.

## Texas

Trinity River, Northeastern (Flood Prevention Act of 1944): Completed, under construction, or under contract were 234 floodwater retarding structures. Of these, 49 were constructed during the 1959 fiscal year. Fifty-four floodwater retarding structures and 14 miles of channel improvement were scheduled for construction during the 1960 fiscal year.

Escondido Creek, Karnes County (Pilot): All 11 of the planned floodwater retarding structures had been installed. Final Federal cost exceeded original work plan estimates by about 5 percent. Modification in design of some structures prior to construction and procedural changes in determining cost estimates contributed to the differences.

## Oklahoma

Little Wewoka-Graves Creek, Hughes, Seminole, Okfuskee Counties (PL 566): Of the 18 floodwater retarding structures planned, 5 had been built at a Federal cost of \$155,566, about 8 percent less than the work plan estimates. Contracts had been let on two additional structures in the amount of \$81,522. About 75 percent were complete. Bids were to be opened early this fiscal year on two additional sites, with an estimated Federal cost of \$111,970. Total estimated Federal cost of all floodwater retarding structures is \$712,598.

Combination of practices holds soil above detention dam, East Willow Creek watershed, Fillmore County, Minn.



## Tennessee

Wolf River Tributaries, Marry's and Sand Creeks, Shelby and Fayette Counties (Pilot): Of the 12 floodwater retarding structures planned, 5 had been completed at a Federal cost of \$121,000. Contract had been let for one additional structure to cost \$15,000, about 3 percent more than the estimate. It was about 10 percent complete. One of the structures is multi-purpose, including storage for irrigation and recreation.

## Utah

Green's Lake, Iron County (PL 566): All of the structures including two debris basins, three floodwater dams, and one floodwater diversion channel had been completed under one contract at a Federal cost of \$188,935. In addition, a second contract was completed at a Federal cost of \$3,940 for 25 acres of seeding of the dikes and earthen embankments on the above structures, 3½ acres of mulching, and 1¼ miles of fencing to protect the seeding.

## West Virginia

Daves Fork-Christian's Fork, Mercer County (PL 566): All three of the planned floodwater retarding structures had been constructed at a contract cost of \$87,000, about 2 percent under work plan estimates. Planned for installation in fiscal year 1960 were 66,000 feet of channel improvement. The State Road Commission installed a major highway culvert on U. S. Route 219 to conform to line and grade of the proposed channel job. The channel work will integrate with similar work on Brush Creek to be built by the U. S. Corps of Engineers.

Well vegetated emergency spillway is part of flood water retarding structure on a Nebraska farm.





# How Well Do They Work?

The effectiveness of a watershed protection project depends on the stage of the installation of the planned land treatment and structural measures. The more advanced the installation of these measures is, the more effectively the project may be expected to perform when tested by severe storms. A number of projects that are well along toward completion have not yet been subjected to sufficiently severe storms to adequately test their effectiveness. Other have received severe tests during construction.

As may be expected the most notable examples in the performance of projects under storms are in the older ones. Many of those are pilot projects. The following examples are from the fiscal year summaries.

## Delaware

Bear Hole, Sussex County (PL 566): The Bear Hole Project in Delaware was finished in March 1959. Four months later a rainstorm hit the area with an intensity expected only once every half century. People who have lived there longer than that said they had never seen such a downpour. Thirteen inches of rain fell in 6 days, July 10 to 15, after the earth had been saturated.

The crop growing season was at its peak, but Bear Hole Watershed handled the deluge with an estimated crop damage of only \$2,000. Farmers in unprotected areas figured damages five times as great. The second day after the rain stopped, Bear Hole Watershed farmers were out in the fields on their tractors. In wholly unprotected areas, farmers were still unable to get into their fields after 2 weeks.

## Arkansas

Six Mile Creek, Logan and Franklin Counties (Pilot): Following a heavy rainstorm in April 1957, the works of improvement installed at that time (structural measures 90 percent complete) reduced the flood damage 50 percent. Had a completed program been in place, the reduction in damages would have been an estimated 77 percent.

Clyde Hiatt, chairman of the Franklin County Soil Conservation District board of supervisors, said that after a period of heavy and continued rainfall, the greatest since 1902, the Six Mile Creek Project performed according to expectations.

Henry Gray, a landowner in the lower flood plain, experienced some flooding for less than 24 hours following the April storm. He said that this was the only time the Six Mile Creek overflowed his land that spring. Without the project his farm would have been flooded

at least 12 times when the Arkansas River remained at flood stage 55 days.

## Iowa

Honey Creek, Lucas County (Pilot): The evening of July 1, 1958, rainfall ranging from 3 inches to 4.7 inches fell in parts of the watershed. Some overflow at the lower end caused slight damage. The soil was dry prior to the rain. The overflow could have been prevented by creek channel improvement and removal of willows and other trees.

The first 5 months of 1959 were the wettest on record in the vicinity of Honey Creek. About 22 inches of snow-melt and rain were received by the end of May.

In May, rain occurred on 19 of the 31 days. On May 30, following a 3-day rainy period, more than 5 inches of water fell over the upper two-thirds of the watershed and 4.25 inches fell over the lower end. Recording gages showed that about 2 inches of this rain fell between 7:30 and 8:20 p.m. and the remainder by midnight. This was probably the worst flood-producing situation of record here, exceeding that of June 1947. The project stood the test.

## Nebraska

Indian Creek, Gage County (Pilot): Until spring of 1959 there had been no storms within the watershed that tested the effectiveness of the program. Several storms with sufficient precipitation to fill the flood-water retarding reservoirs above the primary spillways

Fisherman on detention reservoir, Sandstone Creek, reaps one benefit of watershed protection.





had occurred but none that required use of the emergency spillway.

Last spring a 6- to 8-inch rain of short duration fell in the northern part of the watershed. It filled the floodwater retarding reservoirs and some flow went through the emergency spillways. All reservoirs in which this occurred functioned satisfactorily and without damage to the spillways or structures. Moderate to severe flooding on flood plain lands within the watershed were prevented on several occasions during recent years because of the effectiveness of the floodwater retarding structures and applied land treatment practices.

A high degree of land treatment has been applied, including terraces and grassed waterways, crop rotations, grass and legume seeding for hay and pasture, small stockwater ponds, and erosion control structures.

The numerous stabilizing and sediment control structures installed have been effective in retarding channel erosion and in providing base grade points for smaller erosion control structures and terraces system outlets. Substantial reductions have been made in reservoir sediment deposition and detention storage requirements because of the water held back by land treatment.

## New Mexico

Hatch Valley Arroyos, Sierra and Dona Anna Counties (PL 566): All structures received flood runoff immediately after or during construction. No damage from floodwater or sediment occurred on the protected areas. Damages on adjacent unprotected farmland amounted to thousands of dollars.

Site 6 (Garfield) was completed in August 1957. While under construction it received flood runoff from 3 small and 2 moderate-sized storms. The structure prevented severe damage from flood runoff during these storms.

Site 5 (Rodey) was completed in July 1958. The structure controlled flood runoff from 3 storms the first summer. Rainfall for each storm was estimated at 2 to 3 inches. Approximately 50 percent of the storage capacity was used to control the floods. Without the structure it is estimated that damage would have amounted to approximately \$8,500 in crop loss plus \$3,000 damage to farmsteads and irrigation facilities.

## South Carolina

Twelve Mile Creek, Pickens County (Pilot): As a result of channel improvement work and the construction of a floodwater retarding structure, the usable area along Rice's Creek had increased an average of 20 percent. Each year since works of improvement began, landowners are using flood plain land more intensively. The crops include watermelon, corn, small grains, and improved pastures.

"We are able to use this floodplain land more intensively," Robert S. O'Dell said, "because of the floodwater retarding dam built up the valley and the stream channel improvement work done along Rice's Creek. It has reduced the frequency of flooding to the extent we are not worried about the risk."

State highway and county road officials continued to reduce the capacity of drainage culverts and bridges as they were replaced on roads immediately downstream from floodwater retarding structures.

## Texas

Sulphur Creek, Lampasas and Burnet Counties (PL 566): During the latter part of June 1959, torrential rains in and near the Sulphur Creek Watershed, measuring up to 8.5 inches at Nix, 14 miles west of Lampasas, failed to produce flooding along the stream in the vicinity of Lampasas. This storm came when three floodwater retarding structures were installed, one approximately 25 percent completed and another about 15 percent finished. Reduction in floodwater damage because of installed measures was estimated at approximately \$5,000.

## Washington

Saar Creek, Whatcom County (PL 566): When construction was started in 1958, the driest summer on record occurred. Saar Creek dried up. Unusually damaging and frequent storms occurred during the winter of 1958-59. That part of Saar Creek where construction was completed performed as planned. That part of the channel where construction was to be done in the spring of 1959 overflowed its banks and all adjoining land was flooded.



# Taming the Washita

*Local people have subdued parts of an unruly river and remaining job moves ahead rapidly.*

By RAY WALKER

The Washita River Watershed consists of 7,871 square miles and is divided into 64 sub-watersheds for work plan development, local participation, and operation. The primary problems are erosion on upland and frequent flooding of 265,000 acres of bottomland along the tributaries and 112,000 acres on the main stem of the Washita River.

Local cooperating agencies such as watershed associations and soil conservation districts promote the activities in each watershed. Guidance is furnished in priorities of work by overall leadership in the watersheds through the Washita Flood Prevention Council. The council is made up of members of the board of supervisors of each soil conservation district and the officers and directors of the watershed associations concerned.

Land treatment accomplishment has been outstanding over much of the Washita watershed. In the Upper Washita Soil Conservation District some 22,325 acres of range seeding was done this year. This makes 87,013 acres now

on the land in the district. Other accomplishments included 200 stock ponds, 322 miles of terracing, 60,773 acres of range properly used, 150 waterways, 17,906 acres of cover cropping—all in the Upper Washita district. Other districts reported similar accomplishments.

Installation of the practices reflects the determined efforts of local people to keep the land treatment phase of watershed work ahead of construction. The district governing bodies are giving excellent service in this phase. An ample number of grass seed drills were made available to cooperators to get the range seeding job done. High-quality seed stock is kept in abundant supply by the various governing bodies. Bermuda spriggers, fertilizer spreaders, brush cutters, land levelers, and other conservation equipment are easily available to the cooperators from the districts.

The ASC committees in the various counties have placed added emphasis on the watershed treatment program and their efforts have materially helped get conservation on the land.

An effective gully control program was installed during the year on several watersheds.

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Note:—The author is State conservationist, Soil Conservation Service, Stillwater, Okla.

**County road crossing detention dam eliminates cost of bridge and road damage, Barnitz Creek watershed.**



**In 20 years, flood sediment half covered this 50-year-old house in Roger Mills County, Okla.**





Silt-contributing gullies were treated by sloping the sides and grassing the disturbed areas to Bermudagrass, native grass, or King Ranch bluestem. This has resulted in a great reduction of soil loss, increased the infiltration rate of the rainfall into the soil, and materially reduced the siltation on bottomlands downstream.

Approximately 65 percent of the Washita River watershed drainage area is under farm conservation plan and agreement with local soil conservation districts. All watersheds having structural measures installed have at least 75 percent of the planned practices applied on land which is considered to be a large silt-contributing source.

Construction progressed on 106 structures in 15 watersheds in fiscal year 1959. Nine Mile, Panther, and Cobb Creeks were completed. All the structures on Broken Leg, Dead Indian-Wildhorse, and Fast Runner were under construction. The remaining sites on Cavalry and Saddle Mountain Creeks were being built.

Five watershed work plans were approved by the sponsoring agencies in fiscal year 1959. The Upper Washita subwatershed, which has a total area in Oklahoma and Texas of 471,730 acres, was presented to the various sponsoring agencies in June. All easements and rights-of-way had been cleared on the 24 flood detention sites on the Oklahoma side.

District supervisors took the leadership and within a period of 2 months all easements were in hand. The sponsoring agency allocated some \$2,000 to move wells and houses. The county commissioners will rebuild and relocate roads in seven of the sites.

Easements were being obtained by the soil conservation district supervisors, members of the watershed associations, and other interested parties from property owners on 12 subwatersheds. The Criner Creek Flood Prevention Association is an outstanding example of local interest and accomplishments. Money was raised by this group from voluntary and popular subscription to pay for hard-to-get easements. In one night more than \$2,000 was raised among the board of directors.

Turkey Creek subwatershed plan was presented to sponsors in July. All easements on the 12 sites on this watershed were cleared. The City of Clinton, Okla., contributed \$16,000 and

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**EDITOR'S NOTE:** Here is more detail on one flood prevention activity. This story is a summary of the annual year-end progress report of the Washita project and supplements the preceding "Special Report" on watersheds. Work in the Washita has been under way longer than most others, having been started under the Flood Control Act of 1944. For more background, dating back to the 1920's, see "The Washita Story" in SOIL CONSERVATION Magazine, July 1957.

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the sponsoring agencies \$2,000 to clear hardship easements on the three detention structures above the Clinton water supply.

Sugar Creek was presented to the sponsoring agencies in April. The easement drive was progressing nicely with 20 percent of the easements for the 43 floodwater retarding structures in hand.

State agencies, such as the State Soil Conservation Board, Board of County Commissioners, State Highway Commissioners, and others are participating in developing work plans and cooperating in the installation of land treatment and structural measures. The Oklahoma State Legislature provided \$145,000 in revolving funds to provide land through condemnation proceedings and to dispose of surplus undeeded land. This money is used over and over to acquire additional property.

Boards of county commissioners are cooperating in relocating roads, moving bridges, and otherwise adjusting county road systems to conform to watershed work plans.

One such job in the Peavine Creek watershed meant raising  $\frac{5}{8}$  of a mile of county roadbed as much as 10 feet. Six pieces of heavy equipment were used at one time to speed up the work.

**Mulch spreader applies a ton per acre after seedbed preparation on new dam.**



Federal agencies, in addition to the Soil Conservation Service, are cooperating. The Extension Service is assisting with the educational phase of the program. The Bureau of Indian Affairs, in addition to assisting in the preparation of work plans, has been instrumental in securing easements from restricted Indian landowners. The bureau also has assisted and encouraged land treatment measures on the farms under its jurisdiction.

The stabilization and conservation programs have helped farmers financially in carrying out various soil conservation measures necessary for proper land treatment. The Farmers Home Administration assisted certain farmers financially in carrying out intensive soil conservation programs. The vocational-agricultural departments in the various high schools gave assistance along the same line.

The completed Mill Creek watershed in Murray County, Okla., is an example of benefits from an upstream flood prevention program. After 18 floodwater retarding structures were completely installed, more than 500 acres of cropland, formerly subject to overflow, were placed under irrigation. These acres were leveled immediately below four retarding structures and placed under irrigation, using water from two irrigation wells with 4,500 gallons per minute capacity.

To condition the land for high value crops, such as alfalfa, the area was planted to rye and hairy vetch the first year. This allowed the newly placed soil in the leveled areas to settle before alfalfa was seeded. Alfalfa production was 4 tons per acre up to July 1. Yields of 8 tons per acre are anticipated in 1960.

Automatic sprigging machine sets common Bermuda-grass roots on slope of new dam.



On May 25 and 26, 1959, flood producing rains occurred on a number of watersheds in the Washita. Panther, Kiowa, and Whiteshield Creeks received rains of from 6 to 10.5 inches over a 9-hour period, with intensities reaching 1.27 inches in 7 minutes. Two sites on Panther discharged through the emergency spillways. Site No. 1, Kiowa Creek, had a small amount of flow through the emergency spillway. Flood producing rains occurred on Sandstone, Beaver Dam, Sergeant Major, Nine Mile, and Barnitz during the same period. Some flooding occurred on Sandstone, Panther, and Barnitz but farmers and ranchers were enthusiastic in their praise of the flood prevention program on the treated watersheds.

W. S. Haitt of Hammon, reported that the structures on Kiowa Creek prevented the total loss of 100 acres of his wheat. He harvested 37 bushels an acre. Mr. Peterson on Panther Creek gave two structures credit for preventing complete destruction of 60 acres of bottom land.

Not one acre of wheat was lost on Barnitz Creek due to flooding. Nine Mile and Kiowa Creek overflowed less than 50 acres. Beaver Dam and Sergeant Major Creek never left their channels. Flood on Sandstone did very little damage to wheat. Watersheds such as Whiteshield and Beaver Creek, where only two small structures are in place, had untold damage. The entire flood plain was covered, crop damage was high, and six bridges were lost on Whiteshield alone.

Some people familiar with the flood of 1934 believe that a greater amount of water fell during the May 25-26 rains than on April 3, 1934. They gave credit to the treated watershed, the excellent vegetative cover on the rangeland, and the great amount of land treatment on the cultivated land for preventing even greater damage than in 1934.

Many multiple purpose projects have resulted in great benefits to municipalities and individual landowners. The City of Marlow, Okla., is cooperating and participating in the cost of Rush Creek Site No. 1 at the head of Rush Creek watershed. This will impound 2,000 acre-feet of water for the City of Marlow, in addition to the 4,000 acre-feet of flood storage planned in the original program from a drainage area of 13,000 acres. The City of Duncan voted a \$500,000 bond issue to participate in the con-



struction of Wildhorse Creek Site No. 39 wherein 30,000 acre-feet of water will be stored and impounded or detained from a drainage area of 24,000 acres. Easements and purchases are being acquired by the two municipalities for the construction of the two reservoirs.

Stream channel stabilization measures were being carried on by interested landowners at their own expense on the flood plain below the

floodwater retarding structures. Previous to the works and measures being installed, floodwater damage and erosion had made it impractical to carry on work of this kind. Areas formerly covered with trees, shrubs, and perennial weeds on bottom land are being cleared and the land returned to improved grasses and legumes for the production of high forage crops for livestock.

## Need for good forage and land protection bring

# Better Grass on the Range

Progress in range seeding is illustrated by accomplishments of the Twin Falls Soil Conservation District in southern Idaho last fiscal year. When the district was organized in 1951, poor condition of much of the range offered vast opportunities for improvement. At that time, practically no attempts had been made at range improvement through reseeding.

Today, 129 ranchers have made range seedings a part of their conservation ranch program and have well over 100,000 acres of successful seeding. This practice alone has increased forage production from 5 to 20 times on some ranches. Ranchers in the district have contributed from 20 to 50 percent of the cost of seeding an even larger acreage of Federal range lands which they use under lease or permit.

In addition to increased forage and better soil protection, some ranchers materially added to their income last year through the sale of more than 200,000 pounds of grass and legume seed for range seedings in southern Idaho and neighboring states.

With an additional 27,000 acres of seeding planned this year, the landscape in the Twin Falls Soil Conservation District is changing rapidly from sagebrush to grass.

Throughout the West, development of better tillage and seeding equipment has helped get better grass.

In several soil conservation districts of southwestern Kansas extensive areas of rangeland had been reduced to sand, sagebrush, and weeds. The deep, coarse sands were a major source of

wind erosion because of the absence of adequate plant cover. Plowing to prepare a seedbed for range seeding merely made matters worse and seeding directly into the existing cover was not successful because of competition from established plants.

Under these conditions it became obvious that special equipment and seeding methods would have to be devised. Equipment developed for this purpose includes a tool bar on which two lister-type shovels and individual seed hoppers are mounted. The shovels clear foot-wide strips of the existing vegetation and the seed is dropped in furrows 2 inches deep 42 inches apart. The tool bar is hinged to permit its use on rolling terrain.

Use of this equipment reduces competition sufficiently to permit the new grass seedlings to become established without increasing the wind erosion hazard.

During the past 2 years more than 100,000 acres of depleted sandy rangeland in southwestern Kansas have been successfully seeded in this manner, most of it to native grasses.

♦

ADVANCING EDUCATION IN THE GREAT PLAINS PROGRAM, published by Colorado Agricultural Extension Service, is a report of recent meeting of representatives of Extension Service, Soil Conservation Service, soil conservation districts, and others to evaluate progress and plan further educational work.

# CUTTING THE CORNERS

By GLEN E. MURRAY

**"I**N the dairy business today, you've got to cut every corner possible to make a living. I'm operating a first-class grade A dairy, but I'm getting a grade A price for less than half of my milk, so you can see why I am concerned with economy of operation." This was one of the points brought up by Mac Fitzgerald, a dairyman of Draper, Utah, as he talked about how he uses and manages his irrigated pasture.

Mr. Fitzgerald milks 40 head of purebred Guernsey cows which average 4.7 percent butterfat. These cows are on 12 acres of pasture for 5 months each year. The pasture is carrying around 3.5 cows per acre for the grazing season. This pasturage is supplemented with 15 pounds of corn silage and 1 pound of grain for each 5 pounds of butterfat for each cow.

---

Note:—The author is work unit conservationist, Soil Conservation Service, Murray, Utah.

Mr. Fitzgerald's 12-acre pasture is divided into five feeding plots to facilitate grazing management. Each plot is grazed 4 to 8 days, depending on the season and growing conditions. Immediately after grazing, the plots are harrowed to scatter the droppings, and after every other grazing the plots are clipped to reduce weed seeding and to increase palatability of the forage. Irrigation water is applied and the pastures are allowed to grow for 16 to 23 days before being grazed again. Irrigation water is applied by the border method on leveled land.

The pasture originally was seeded 8 years ago to a mixture of smooth brome, tall meadow oatgrass, orchardgrass, ladino clover, and red clover. The smooth brome, orchardgrass, and the clovers are still doing the job intended, with the tall oatgrass going out after 2 years of

Mac Fitzgerald and his granddaughter Karen in one of the improved pastures with farmstead windbreak in the background.





grazing. But an infestation of strawberry clover is now causing some concern due to the fact that it crowds the better producing clovers out, and volume-wise is a low producer. Mr. Fitzgerald thinks that the area will have to be re-seeded soon to restore the high-producing clovers.

Mr. Fitzgerald has been a cooperator with the West Salt Lake Soil Conservation District for 15 years, and he has been the leader in the field of pasture management in this area. Shortly after becoming a cooperator with the district, he developed a conservation plan with the help of Soil Conservation Service technicians. He has followed his plan explicitly and production has even exceeded expectations. In one instance, the plan stated that the pasture planting should result in a carrying capacity of 2 or 3 cows per acre, yet today the capacity is around 3½ cows per acre.

To look at the Fitzgerald farm, it is easy to read the story of conservation farming. Tile drains have been installed to facilitate cropping the land. The irrigation system is efficiently operated and maintained. Underground pipelines, open concrete ditches, and control structures deliver water to leveled land, which has been cropped and managed properly. Wind-breaks protect and beautify some of the nicest looking farm buildings seen anywhere.

Registered Guernseys on a rotation pasture on the Mac Fitzgerald dairy farm.



"It's not all done yet," says Mac of his improvements. "I've still got a field or two that needs a little leveling and have a few more improvements to make in my irrigation system, then I still want to do some more fertility management on the pasture area." So, although the improvements have been great, there are still more to come.

## Conservation Leaders Face Challenge

Despite the rapidly growing technical complexity of today's living, there is a growing appreciation of the role of natural resources, D. A. Williams, SCS Administrator, told State conservationists at their annual meeting in September. Thinking people in all walks of life are rapidly coming to realize that most of the great developments of our time could ultimately be meaningless if we do not maintain our resource base.

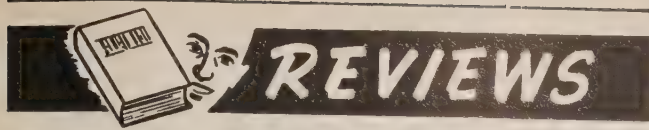
At the same time, we face a special challenge. Because "conservation" is a good word, and one in the public domain, it has been adopted by many different kinds of programs and movements. We have no patent on the term, so it becomes especially important for us to define our words—to help others to understand that it isn't enough merely to be "for conservation."

True conservation of soil and water resources may well be at the crossroads in officialdom as well as with the public unless the fundamentals are recognized and made widely known.

We may well see a decline in conservation interest unless those who know and care stand fast with integrity to these fundamentals.

The only way to insure proper understanding of the fundamentals and primary urgency of soil and water conservation is to meet directly with leaders, take them to the land, and provide them with meaningful, helpful materials that put the many types of "conservation" in their proper perspective.

Leadership geared to the rapidly and constantly changing world around us—is an essential requirement in the soil and water conservation program today.



**FOOD: The Yearbook Of Agriculture.** 736 pp. Illus. 1959. Washington, D. C.: U. S. Government Printing Office. \$2.25.

For browsing or for specific information, for a recipe, for menus, or for the structural formula of a monosaturated fat, FOOD is an excellent addition to a long series of successful Yearbooks.

The book is divided into eleven parts: Backgrounds, The Nutrients, Health, Allowances, Our Needs, Quality, Preparation, Costs, Trends, Learning and Programs. The 66 chapters are by experts in every phase of food research, teaching, and processing. Several chapters contain material of historical interest to the layman: The Story of Nutrition, The Nutriture of People, and The Pure Food Law.

The nutrients in foods are discussed by a distinguished group of research workers, yet the style of presentation is such that the interested layman will enjoy reading any of these chapters. The limited number of technical terms used are clearly defined in a glossary. An occasional fault may be oversimplification—such as the presentation of a structural formula with the statement “The acid group looks like this:”

The tables of recommended daily dietary allowances and of nutrients in common foods in terms of household management are as complete as current data permit and should be in the hands of every dietitian. Vitamin A value, thiamine, riboflavin, niacin, and ascorbic acid values as well as the common minerals and protein and energy components are included for 418 foods.

Food quality and the production of both meat and vegetables of high nutritional and marketable quality are given the recognition their importance demands. The measures taken to ensure clean wholesome foods of perishable nature are described. The meaning of grades for meat, dairy, fish and poultry products is discussed. The factors of taste and prejudice that influence the choice of food and measures of quality are presented.

But the real problem to the housewife—the selection of a tender piece of meat or of a

melon or sweet potato of good flavor or texture—has not yet been answered. Many reasons are advanced to explain the poor quality of some of the fruits and vegetables reaching the market, but the outlook for marked improvement under our complicated system of food distribution appears dim.

The practical hints to the housewife on such subjects as food costs, dietary recommendations for children, food preparation, and graded foods are only a few examples of the value of this book to the home. Freezing, canning, and storage with particular emphasis on conserving nutritive value are treated. Some of the basic reasons for success or failure in cooking are discussed in the chapter “When You Cook.”

FOOD should have a wide audience among teachers and research workers in agriculture, food technology, and distribution as well as physicians, dentists, and dietitians.

—KENNETH C. BENSON

**SNOW SURVEYORS: Defenders Against Flood And Drought.** By C. B. Colby. 48 pp. 1959. Coward-McCann, Inc.: New York. \$2.

“A very attractive book,” is the first reaction one gets of this 48 page beautifully illustrated “picture book” about snow surveyors.

To those who enjoy winter’s out-of-door splendors, this book, with its large collection of beautiful snow scenes, taken in the high mountain areas of the West, will add enjoyment.

For others, who want to know more about the hazardous life of these “snowflake men” the author effectively portrays their work as they go by skis, snowshoes, or over-snow machines to the higher mountains to measure the snow.

To the practical minded soil and water conservationist this story gives the purpose and importance of snow surveys. Colby explains how the hardy snow surveyor goes many times during the winter months to measure snow so the amount of available water can be accurately forecast. About 1,000 men make at least one trip each winter to one of the 1,300 snow courses. The “snowflake men” often face blizzards and hazardous hardships to carry out this worthwhile mission.

If the forecast shows more water than usual



CHANGE OF ADDRESS SHOULD INCLUDE ZONE, OLD ADDRESS, AND CODE NUMBER

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the reservoirs in the rivers below can be lowered, dikes constructed, and other precautions taken to prevent damaging floods.

If the snow measurements show there will be a shortage of water; farmers, conservationists, power companies, etc., can adjust their plans to take care of the shortage.

You will find Colby's "Snow Surveyors—Defenders Against Flood and Drought" fascinating reading.

—FAIR C. GRIFFIN

### **Dam saves tax money**

When Mrs. Alberta Klein, Brown County, Kans., needed a new grade stabilization structure on her farm she worked out an agreement with the county government to share costs and build a larger dam farther downstream where a new bridge was needed. SCS technicians in the local soil conservation district gave technical help.

Mrs. Klein got her dam at no increased cost, gave up no land for the site, and stabilized a larger area of land. The county put the road across the dam and saved \$5,045 of tax money.

Six other similar agreements in Brown County have given farmers either grade stabilization structures or stock water ponds. ACP "cost sharing" helped with the financing.

Many districts have printed or mimeographed "drive-it-yourself" tour guides so visitors can find and see conservation without a conducted tour.

Number of farmers using irrigation in the eastern United States continues to increase.

### **Cooperation brings erosion control and good land use**

The Ukiah Lumber Co., a cooperator of the Walla Walla Soil Conservation District in Washington, obtained Soil Conservation Service technical assistance from the district in making a soil survey of a 700-acre tract of steep and badly eroded cropland. The survey determined the capability of the land for tree planting, indicating which areas were suited to ponderosa pine.

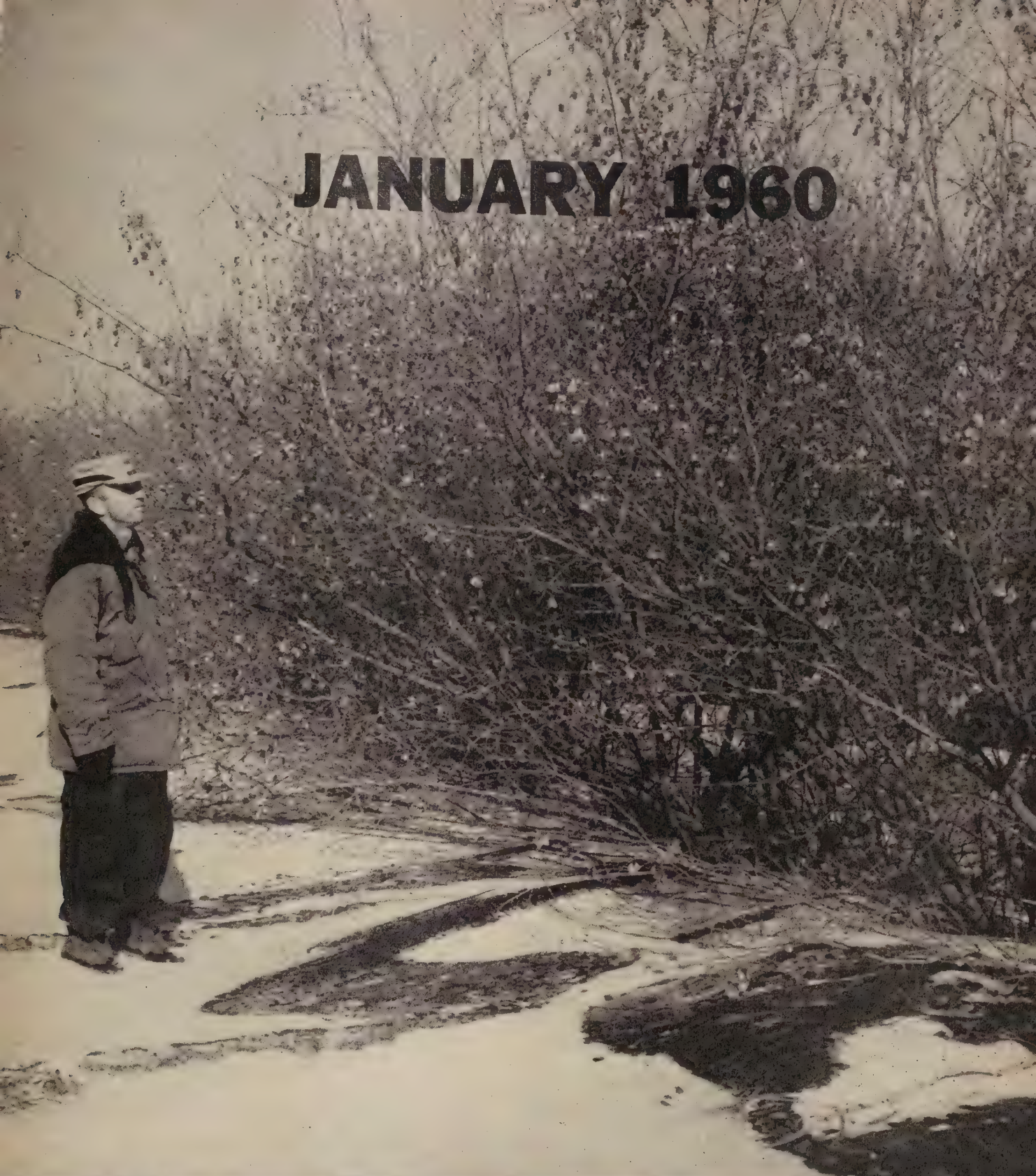
The State Department of Forestry then provided seedling pines, planting machines were furnished by the State Extension Service, and technical assistance in both planning and planting were coordinated by the district among all agencies concerned. Through this cooperative effort a 700-acre tract was planted to trees adapted to the site, erosion control will be achieved, and a profitable crop later on is assured.

Walla Walla experience is one example of cooperation among local, State, and Federal agencies and organizations of farmers or ranchers in profitable use of trees for erosion control and as the best use of certain kinds of land.

By summer of 1959 more than 600 million acres had been soil surveyed in sufficient detail for conservation planning of farms, ranches, and watersheds. This is about half the agriculture land in soil conservation districts or 30 percent of the total land area of the United States.

When the national inventory of conservation needs is completed in 1960 it will provide reliable data on the size of the soil and water conservation job, including small watershed project needs. Facts are now being compiled on a county and state basis.





**JANUARY 1960**

# **SOIL CONSERVATION**

Soil Conservation Service • U. S. Department of Agriculture



# SOIL CONSERVATION

**EZRA TAFT BENSON**  
SECRETARY OF AGRICULTURE

**DONALD A. WILLIAMS**  
ADMINISTRATOR, SOIL CONSERVATION SERVICE

OFFICIAL ORGAN OF THE SOIL CONSERVATION SERVICE  
U. S. DEPARTMENT OF AGRICULTURE, WASHINGTON, D. C.

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TOM DALE, Editor

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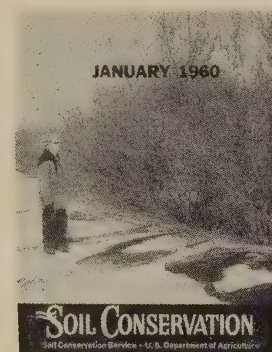


## NEW RESEARCH LABORATORIES.—

Two new soil and water conservation laboratories were dedicated at Morris, Minn. and Tempe, Ariz., during October 1959. The laboratory at Morris will do research on soil and water problems characteristic of western Minnesota and adjacent areas, while the one at Tempe will seek answers to water shortages and other soil and water problems in the arid Southwest. The Morris laboratory is equipped with three unique electronic devices for measuring water percolation in the soil.

WHAT YOU AS A READER think about SOIL CONSERVATION Magazine is important to us. If you have any strong feelings on what you like or dislike, you would like to see more of—or less of—why don't you write a letter to the Editor, SOIL CONSERVATION Magazine, Soil Conservation Service, Washington 25, D. C.

Editors are invited to reprint material originating in this magazine.



**FRONT COVER.**—A Northern Great Plains farmer views a 7-year-old Amur maple hedge which serves as a windbreak and wildlife cover.

All orders go to the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

# Great Plains Conservation Program

## A Second Anniversary Report

By CYRIL LUKER

**T**WO years ago on a mid-December afternoon a strapping North Dakota farmer named Berthold Sackman fixed his signature to a legal-looking document and along with a couple of farmers in Texas, wrote a measure of agricultural history.

With these signatures, the Great Plains Conservation Program—fashioned as a new and handy tool for farmers and ranchers in the drought-bedeveled areas of the Great Plains States—passed from the preparation into the installation phase.

The 24 months that have passed have been generously sprinkled with unexpected turns and twists as the new program moved along. The rate at which soil and water conservation is going onto the too-often-rainless landscape and the opportunity in view for still faster progress merit for the new program an honest appraisal at this point.

The approach of the Great Plains Conservation Program to the agricultural problems of the vast area was direct and clear cut. Its objectives: To halt or reduce erosion, build drought resistance as much as possible into the operations of farmers and ranchers, and to make agriculture in the Great Plains as dependable a business as soil, climate, and agricultural science will permit.

The program's principal offering is a complete soil and water conservation plan for a farm or ranch, based on careful studies of soil and range conditions and custom cut to fit the needs of the unit and the operator thereof.

The program's built-in booster comes from cost-sharing in Federal funds, attached to a timetable for getting the basic job speeded up

and done in no less than 3 years nor more than 10 on any farm or ranch.

Congress put a limit of \$25 million in Federal spending on the program for any single year, with a \$150 million ceiling for the whole program.

An immediate target of all soil conservation work in the Great Plains is the estimated 12 to 14 million acres of low-grade cropland which is too vulnerable to wind and water, and too low in yields over a long period, to be continued in cultivation. This land, to be useful and permanently productive, must be in permanent cover. That means grass usually.

Water for all uses, including the moisture that can be stored in the soil, is another pressing concern; for, in the Plains drought can always be just around a flip of the calendar. Conservation practices are designed to make the most effective use of the water that is available. Some

Berthold Sackman (right) signing one of the first Great Plains Conservation Program contracts in December 1957.



Note:—The author is assistant to the Administrator, in charge of the Great Plains Conservation Program, Soil Conservation Service, Washington, D. C.





A stockwater dugout that is supplied from a deep well constructed as a part of the Great Plains Conservation Program on the L. D. Warne ranch near Onida, S. Dak.

of these practices require investment by the landowner in dams, wells, water-spreading systems, irrigation improvements, or spring development. The Great Plains Conservation Program is proving of great help in this respect.

At the end of the first 2 years about 3,300 farmers and ranchers had entered the program, and had taken advantage of the opportunity to apply all the needed soil and water conservation to their land in return for the technical assistance offered by the trained men of the

Terracing and stripcropping on the Arthur Weinhold farm near Scottsbluff, Nebr. In addition to these conservation practices, Weinhold has seeded a part of his formerly cultivated land to grass under the Great Plains program.



Soil Conservation Service and for the cost-sharing in Federal funds. Federal cost-sharing is based on the average cost of installing a given practice in a county. It ranges from 50 percent in the case of some of the less urgent practices to 80 percent in high priority revegetation work.

The 3,300 farmers and ranchers represent about 1 percent of the 335,000 landowners and operators in the designated area of the Great Plains. Projecting the present average cost per unit for establishing enduring conservation measures (about \$5,300) indicates that the spending of the entire \$150 million authorized for the program will mean complete treatment for about 10 percent of all Great Plains units.

The first major problems arising at the inception of the program involved irrigation. The eagerness with which irrigation farmers hurried to make use of the engineering and cost-sharing help made an immediate braking action essential. Even with the cost-sharing for these practices at the bottom of the scale, it became evident that too large a proportion of the available money was bound to go into land leveling, ditch lining, and other irrigation practices. These practices were all worthy and useful in soil and water conservation, but Congress in designing the program had intended that irrigation play a minor role in stabilizing the Great Plains agriculture and economy. It was intended that irrigation be used mainly to provide additional dependable forage for livestock opera-



tions in building greater agricultural stability in the area. Cost-sharing for irrigation on a single unit, therefore, was limited to \$2,500, or no more than about one-fourth of the total estimated contract obligation.

Then it became apparent that only a system of priorities would make sure that the program would do the job for which it was designed. Farms and ranches with urgent erosion and land use problems went into the high-priority division. Units mainly with brush problems on rangeland were less urgent and irrigation was still further down the list.

The drain upon the program's resources by large units eventually became another problem. A few large operating units, with tremendous areas to treat, could use all the funds available for a county in some instances. This was not a realistic way of doing business in a program whose main objective was to get a maximum amount of soil and water conservation work established over the entire Plains area. The move to limit cost-sharing to \$2,500 times the number of years a contract was in operation raised questions here and there. But these essentials in time and Federal cost shares obviously benefit Plains farmers and ranchers, as a whole, the most.

There have been other questions at various times and places, such as the differences in rates of cost-sharing for the same practice in neighboring counties. The rates, of course, are set by county program committees assigned specifically for the task and are based on the



Stubble mulch farming is a key practice in the Great Plains Conservation Program. Though it does not qualify for cost-sharing, most contract signers are using it on their cultivated fields as a part of their overall conservation plans.

best information the committees can gather on the cost of establishing given practices. Local differences in basic program essentials make such variations inevitable. Means have been provided for local committees to make needed adjustments, which will help smooth out local differences and move the program forward.

From the point of view of the Soil Conservation Service, which was given administrative responsibility for the program, this new program is proving outstandingly successful. Where boards of district supervisors and the

Edward L. Brewer of the Oklahoma Panhandle drilling grass seed on his drought-damaged range as a part of his Great Plains conservation plan. Most of the weeds and sagebrush were killed with a one-way plow before the grass seeding was started.





representatives of local agencies and other groups have provided needed help, progress has been especially gratifying. In hundreds of the districts, the boards of supervisors have led the way in getting the Great Plains Conservation Program started on their own farms and ranches. As true leaders in soil and water conservation, these men have shown the new program to be practical and economically sound.

Most SCS technicians are finding in the Great Plains Conservation Program a means of



Jackson W. Space of Glorieta, N. Mex., shows off some of his formerly poor rangeland that was brought back to high production through reseeding under the Great Plains Conservation Program.

achieving most efficient use of their time. The long range plans make for better scheduling of the time of these trained SCS employees. To each of them, too, a complete conservation plan, with all needed practices applied, is a goal worth striving for.

The 221 counties originally designated by the Secretary of Agriculture for the program have grown to 344. Still others are planning to ask for designation. This is further evidence of the wide acceptance of the new program.

Representatives of the various agricultural agencies, particularly at the county level, have found in the Great Plains Conservation Program a vehicle in which they could all move ahead in service to farmers and ranchers. Cooperation has been convincing.

As for the folks most concerned, men like Bert Sackman, they are discovering in the program a source of realistic help that enables them to do within a short time a job that would be beyond their means and time if they had to depend on their own resources alone. Even if only one farmer or rancher in 10 can make use of the Great Plains Conservation Program, that's a lot of soil and water conservation applied, a lot of land used according to the way it was made, a lot of wind- and water-defying cover on soils that once blew to high heaven, and a lot of the better things of life for many thousands of families in the broad, flattish lands of the Plains.

Bert Sackman is glad the Great Plains Conservation Program came along when it did. He has had a drought to contend with, a mighty serious business when you're trying to get started in the ranching business.

Sackman worked fast and applied most of his 3-year conservation plan in 2 years. His five stockwater ponds held enough water to carry his 100-cow herd through the drouth months. As it was, he was forced to sell only the calves which he otherwise might have kept awhile. Recent rains have perked up the young stand of seeded grass, which will have the best of care a conservation rancher can give it.

"I couldn't have done this on my own," Sackman admits. "The Great Plains Conservation Program has made it possible for me to get going in the livestock business in a relatively short time. I understand the problems in soil and grass and weather that I'm dealing with. Yes, you can say I'm a conservation rancher. And I expect to stay one."

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### **Announce water conservation stamp**

A 4-cent commemorative postage stamp emphasizing the importance of water conservation will be released by the U.S. Post Office Department April 18 during the Seventh National Watershed Congress in Washington, D.C.

To stamp collectors and conservationists, the stamp will be a companion to the commemorative soil conservation stamp released at Rapid City, S. Dak., August 26. It will symbolize the importance of water to all individuals and communities and the urgency of its conservation and wise use.



*The Jaycees and Petroleum Institute will soon honor the 1959*

# Outstanding Young Farmers

By KENT ALVERSON

**T**HROUGHOUT the length and breadth of America, local chapters of the U. S. Junior Chamber of Commerce, commonly known as Jaycees, are hard in pursuit of a brand new set of candidates for a rich and exclusive award—that of Outstanding Young Farmer of 1959.

From now through February, the search will go on. If results follow those of previous years, more than 10,000 nominations will be turned in. They will include the hardest working, sharpest thinking, and most conscientious young farm operators in the 50 States. From these choice candidates will come local, State, and National winners. Those who rise to national

competition will find such honors heaped upon them that previous highlights of their lives will seem humdrum by comparison.

The Outstanding Young Farmer program is now in its sixth year. Cosponsored by the U. S. Jaycees and the American Petroleum Institute, its prime purpose is to focus public attention on the importance of agriculture in America's progress and demonstrate that farming is a profitable, satisfying occupation. It honors the Nation's farmers between the ages of 21 and 36 who have made outstanding contributions to agriculture and their individual communities.

If your conservation is showing, your chances of sharing in the honors are 30 percent better. That's the weight given to conservation accom-

Note:—The author is information specialist, Soil Conservation Service, Milwaukee, Wis.



Six SCD supervisors who were State or National champions of the 1958 Outstanding Young Farmer awards: (left to right) Joe E. Harris, supervisor, Bradley County SCD, Tenn.; L. Stanley Schoelerman, chairman of the board of commissioners, Clay County SCD, Iowa; Paul Ames, director, Coachella SCD, Calif.; Edward F. Mauldin, chairman of the board of supervisors, Colbert County SCD, Ala.; Eyer H. Boies, supervisor, Northeast Elko SCD, Nev.; and Eric J. Collier, supervisor, Marion SCD, Fla.



plishments in the scorecard used to separate the men from the boys all up and down the line.

When state winners were “wined and dined” in a 4-day celebration in Cedar Rapids, Iowa, early last year, a tally showed that nearly all of them were cooperators with their local soil conservation districts. Six of their number were members of their district governing bodies and had made valuable contributions toward conservation on a community basis.

Just in case some of your Jaycee friends may have looked with favor on your farming exploits and community leadership and are hinting rather strongly that you should be a candidate for the 1959 OYF award—perhaps you’d like to take a quick look at some of the fellows who made it to the 1958 finals. It might help you put a little more polish on this year’s achievements. (If it’s too late for that, perhaps you can convince your friends to “just wait till next year.”)

For example, there’s Paul Ames, one of four national honor winners in the 1958 event. Paul is a husky 6-footer from the Coachella Valley, Indio, Calif. He handles a 1,200-acre citrus and vegetable ranch and markets his produce through the local Co-op. Despite the volume of his farm and market operations, he finds time to serve as a member of his soil conservation district governing body. In that capacity, he was instrumental in introducing a new type of grass that has revolutionized wind erosion control in his area. With his leadership, the district has also focused attention on the need to evaluate soils before designing tile drainage systems.

In his acceptance speech before 1,200 people at the National Award Banquet, Paul said, “I feel greatly humbled to come to a part of the land where you people know how to farm so well. The association with these boys (other candidates and Jaycees) is the highlight of my existence.”

Edward F. Mauldin, trim, dark-eyed and handsome cotton farmer from Alabama, is chairman of the Colbert County Soil Conservation District. He operates two farms covering nearly 2,300 acres and has conservation plans on both. At the same time he has a machinery dealership, runs a cotton gin, teaches Sunday School, and campaigns to improve the lot of

the cotton farmer. He served on the governor’s cotton hardship committee and is an adviser to the State legislative study committee.

You don’t have to be a “big” farmer. Stanley Schoelerman of Everly, Iowa, farms only a quarter section, but he makes it produce heavily with conservation practices, a good rotation, and livestock feeding. He feeds 250 head of cattle and 400 head of hogs each year. Besides farming, he is a soil conservation district commissioner, township tax assessor, and all-around community leader.

It isn’t necessary to be a district supervisor, either, though six of the state award winners were. (Eyer Boies of Nevada; Eric Collier of Florida; and Joe Harris of Tennessee, in addition to those named so far.) The important thing is that you be as outstanding in as many ways as possible—your farming, your home life, and your services to the community.

For the lucky fellows who become state candidates, the trip to the national convention is a thrilling experience. Accompanied by their wives, they spend four glorious days being toasted and entertained by national leaders in agriculture and industry. They engage in public debate on topics of national concern. Best of all, they rub elbows with others of their group who, though lumped together as farmers, live lives as different as day and night. Grass and hay are important to Eyer Boies on his Elko, Nev. cattle ranch; he isn’t worried a bit by corn and cotton allotments. Ronald Heddles of Palmer, Alaska, milks cows by the light of the “midnight sun” and Makoto Nitahara picks flowers, bananas, and oranges from the volcanic cinders of Hilo, Hawaii.

To the sponsors the OYF program is a strong link to hold farm and city together. In this age of specialization it is easy to forget that this great superstructure we call our American way of life will topple over without a productive and enlightened agriculture.

So the search continues—wherever a contour furrow is turned, wherever a better field of corn or cotton is growing, wherever an animal grazes—for the young man on the farm who has matured and developed beyond the rest of the “crop.” An invitation awaits him to join one of the Nation’s most exclusive farm fraternities—Outstanding Young Farmer.

# WILD TURKEYS IN NEBRASKA

By WILFRED J. STUART

**I**N the fall of 1953, the Gordon Wildlife Club turned loose some wild turkeys on the Niobrara River, south of Gordon. These turkeys, imported from West Virginia, consisted of four hens and two gobblers. Today, about 100 turkeys are living near the river in a 20-square mile area.

The members of the wildlife club that spear-headed the drive to import wild turkeys were Bill Davis and M. W. Mills of Gordon. The turkeys were turned loose originally on the Mills ranch. Mr. Mills is a cooperator of the Sheridan County Soil and Water Conservation District and is planting two shelterbelts this year for wildlife protection.

Mills and other cooperators of the soil conservation district have encouraged the spread of the turkeys by applying such practices as stubble mulch tillage, improved range and pasture management, planting of field and farmstead windbreaks, and the growing of grasses and legumes for seed.

These magnificent birds, true natives of the North American Continent, were the ones that Ben Franklin wanted to make our national bird

Note:—The author is work unit conservationist, Soil Conservation Service, Rushville, Nebr.



Group of wild turkeys on the M. W. Mills ranch.

instead of the bald eagle.

The turkeys stayed on the Mills ranch for the first 3 years after being released. In 1957, 34 turkeys were hatched there but in 1958 they scattered and not a single hen was known to nest on the original site of release.

At night these big birds roost in the top of the highest trees they can find and during the day they feed on such things as weed seeds, insects, and grain. When they are full grown wild turkey gobblers will weigh up to 20 pounds and hens up to 12 pounds.



Wild turkey in flight near the Niobrara River.

During the mating season a gobbler will gather four or five hens together and the hens will nest nearby. Turkey hens hatch one brood of poults per year with the average nest containing 12 eggs.

Wild turkeys usually migrate over about a 10-mile area but occasionally they will migrate farther. Ideal turkey ranges need frequent watering places and forested areas for shelter and roostings, so the Niobrara River area qualifies from these standpoints.

Wildlife fans in Sheridan County are hoping that the wild turkeys on the Niobrara will keep on increasing. Perhaps in a few years the Gordon Wildlife Club can point with pride to the reestablishment of the wild turkey in this part of Nebraska, from the modest start of four hens and two gobblers they turned loose in 1953.



# New Mulching Machine

*Aids vegetation of flood control structures*

By EARNEST A. CHRISTIE

**N**CESSITY spurred Robert and Donald Wirth to start building their new mulching machine. So far as they know there is no other machine like it in use today.

In the fall of 1958, a seeding contract was awarded to A. D. Wirth & Sons of Vesper, Kans., to seed floodwater retarding structures and waterway improvement work in the Little Delaware-Mission Creeks watershed of Brown County. The contract specified 2½ tons of good quality prairie hay per acre to be distributed evenly over the seeded areas.

The Wirths had only a field cutter with which to do the required mulching. Use of the field cutter necessitated windrowing, driving over, and blowing the hay onto the seeded areas. Robert readily admits, "We started out on a shoestring as far as a mulching machine was concerned."

Although the Wirth brothers were long on

patience and perseverance they were short of their goal on accomplishment. With only 40 per cent of their contract completed, cold weather set in and a winter shutdown was in order.

Robert and Donald arrived on the scene the following spring with the announcement they had invented a new mulching machine they thought would get the job done. It wasn't that easy. The first time the machine was used on prairie hay disappointment was the order of the day. Donald said, "We have too much invested in this thing to give up now. We think we can make it work." An auger was installed to feed the hay into the blower, some belts were tightened, and a successful mulching machine was in operation.

The machine is powered by a power take-off from a farm tractor. It is designed to carry 60 bales of hay on the platform, and can handle mulch at the rate of about two bales per minute if the hay is in good condition. At this rate mulch can be applied to 1 acre every 36 minutes of operating time. Additional time for loading and hauling will depend upon the distance from

Note:—The author is soil conservationist, Soil Conservation Service, Hiawatha, Kans.



Robert and Donald Wirth operating their mulching machine on the slope of a floodwater retarding structure in the Little Delaware-Mission Creeks watershed.

haystack to seeding area and upon available manpower. The machine requires a minimum of three men to operate—one to drive the tractor, one to feed, and one to handle the blower.

Donald made the remark, "Maybe we can use this back home to mulch potatoes." He may have been jesting about the potential use of this machine, but it has some possibilities from the viewpoint of a conservation cooperator. For instance, how much would it be worth to a farmer to be virtually assured of getting a good stand of grass in that new waterway he just seeded? How much would it have been worth to another farmer who seeded his waterway three or four times and now has a weed patch with a gully in it to show for his efforts? Mulching waterways can be especially beneficial if poor soils or steep slopes are a factor.



Machine used by the Wirth brothers to anchor mulch spread by their mulching machine.

The value of using mulch to obtain a stand of grass is well recognized. The mulch breaks raindrops as they fall, holds moisture, and reduces scouring from runoff. At the rate this machine can apply prairie hay, a waterway 1,000 feet long and 40 feet wide could be mulched in less than an hour of actual operating time.

Immediately following the mulching operation, mulch material should be anchored to reduce the hazards of wind and water erosion. On the above-mentioned seedling contract a weighted anchoring machine, featuring straight-set serrated discs of 12-inch spacing, was used. A closer spacing might have been desirable. Insofar as possible anchoring was done across the prevailing slope.

## Stubble Mulch Judging Contest

The first known Stubble Mulch Judging Contest for 4-H Club and FFA members was started at Scottsbluff, Nebr., in the spring of 1958, when a training meeting for 4-H leaders was held. Extension Agronomists C. R. Fenster and Chet Swinbank, and Extension Conservationist Harold Gilman were among those who attended the meeting and later helped in developing a scorecard and rules for future contests.

A preliminary contest was held at the Box Butte Experiment Station at Alliance, Nebr., in the fall of 1958 with Alliance FFA members competing. From this contest the scorecard and rules were refined and published.

Area contests were held at Alliance and Imperial, Nebr., in the fall of 1959 in conjunction with land and range judging contests. These contests were sponsored by the Extension Service, Soil Conservation Service, Vocational Agriculture departments, and Soil Conservation Districts of western Nebraska. The principal contestants were FFA and 4-H Club members, but several adults participated.

The main objective of these contests is to train contestants in determining the effectiveness of stubble mulch soil cover for wind erosion control, though some consideration is given to other soil management practices. With modifications the scorecard and contest rules might be used in areas where water erosion control or moisture conservation are the chief problems.

Pointers on staging stubble mulch judging contest, along with a copy of the scoreboard, are given in an Extension Circular published by the Box Butte Experiment Station, Alliance, Nebr.

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### GRASS-CLOVER MIXTURES IN BEEF TRIALS.—

Two grass-clover mixtures gave "very satisfactory results" in a 3-year beef-production test conducted at the University of Kentucky Experiment Station. A mixture of Kentucky bluegrass and white clover produced \$81 worth of beef per acre and gave an average daily gain of 1.65 pounds. A mixture of smooth brome-grass and Ladino clover produced \$79 worth of beef per acre and gave average daily gains of 1.7 pounds. A mixture of bluegrass and birdsfoot trefoil produced \$57.60 worth of beef per acre and averaged 1.46 pounds daily gains.



# Pequest Watershed Points

By JOHN F. BOZZUFFI

**T**HE Pequest pilot watershed protection project in northwest New Jersey is completed and there are no floods now.

With relief from floods have come increased crop harvests that mean better business to storekeepers and businessmen in the Hackettstown area. Higher land values mean increased tax income to the municipalities. A renewed confidence in crop production encouraged the farmers to organize their own vegetable marketing cooperative.

There are no more sleepless nights when the rain starts to fall because the Pequest River now remains within its banks. "Our worries are over," says Stanley Kott, who has spent years fighting water problems on the meadows. "Now we can get on the land early in the spring and be sure of harvesting our crops."

Mike Kenny, who can remember floods since he was a boy, said: "Our flooding problem is licked and our land values have jumped \$300

to \$700 an acre." These are the reports that farmers in the Great Meadows and Alphano muck areas in northwest New Jersey are making.

The Pequest was one of the original pilot watershed projects authorized in 1953 and started in December 1955. As early as the spring of 1957, after heavy rains and with only part of the construction work done, flooding did not stall farming operations or damage crops.

The 1,000 acres of rich vegetable land lying within the 69,120-acre watershed were an easy target for the Pequest floodwaters. Small floods had occurred almost annually. Big floods were repeated every 5 to 7 years, like the one in July 1945, which caused over \$500,000 damage to crops of lettuce, carrots, and onions.

News of the pilot watershed program reached the supervisors of the Warren and Sussex Soil Conservation Districts in 1953. They felt this was a way to get the hard working truck farmers out of trouble. The two districts agreed to cosponsor the project.

Representatives from the districts, town, county, and state governments, Pequest Water-

Note:—The author is work unit conservationist, Soil Conservation Service, Hackettstown, N. J.





# the Way

shed Association, Soil Conservation Service, Extension Service and other agencies helped to develop the work plan for the project. The plan contained a detailed description of the watershed problems, the work to be done, who was to do it, and the cost.

Ten miles of the main channel of the Pequest required improvement. Debris had to be removed, the channel deepened, widened, straightened and several sections riprapped to increase the channel's capacity. Local people installed more than 3 miles of main outlet channels leading from the muckland as part of their contribution to the project.

Within the watershed were 310 farms. More than 90 percent of them were in the upland area. Some of the farmers had already applied

**Pictures: (lower left) Draglines dredging the Pequest channel . . . (lower center) The Great Meadows muckland under flood water . . . (upper right) Planting truck crops in the early spring on the Mike Kenny farm . . . (center right) Mike and Mrs. Kenny look over their bumper crop of onions . . . (lower right) Harvesting lettuce in early June on the Kenny farm.**





conservation measures to their land, but a lot of work still had to be done. With a concerted effort the farmers went to work. At present a little over 80 percent of the planned soil conservation practices are actually on the land.

With the extra help offered, the farmers in the upland areas were able to install conservation measures at a faster rate. Along with contributing to flood prevention, the stripcropping, diversion ditches, revegetation, conservation crop rotation, and reforestation helped to hold the soil and water in place and increase crop yields.

The project cost about \$700,000. Jack Rogers, a local produce buyer, says: "The project will eventually pay for itself with the increased taxes the farmers will be able to pay. I have had to pay more taxes this year myself because of increased business with the truck farmers."

Economists have estimated that for each \$1 spent on the project a \$3 dividend will be returned.

The Pequest pilot project helped point the way in solving such problems as obtaining land easements and rights-of-way, construction difficulties, weather setbacks, and many others that were worked out successfully.

A new watershed project is in operation, under Public Law 566, on the Paulinskill River, a neighboring watershed. Already the Soil Conservation Service, district supervisors, and local organizations have taken precautions to avoid the unforeseen difficulties encountered on the Pequest. The Pequest, like many of the other pilot projects paved the way toward an even more effective and beneficial watershed program for the future.

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### *Soil tests for insecticides?*

It may be necessary in the future to analyze soils for insecticides before planting certain food crops. That word of warning comes from E. P. Lichtenstein, University of Wisconsin entomologist who has learned that certain crops take up soil insecticides into the edible plant parts.

Too much of certain insecticides—or too frequent applications—may actually put enough insecticide residue into the crop to render it unfit for market at harvest time. Further research may show more about insecticide uptake in crops, giving facts needed to use the insecticides safely without lowering their effectiveness.

# Local People Solve Flooding Problems in Ashley County

By CLAUDE L. PRICE

**H**EAVY rains in the spring and again in the fall of 1958 moved 46 landowners at Montrose, Ark. into action on their drainage and flood problems. Immediately after the May rains, landowners started calling and coming by the SCS office at Hamburg, requesting technical assistance to prevent future flooding of their lands. Charles Henry, the work unit conservationist, explained to the callers that more than just a few people would have to become interested for the project to become a reality. He told Mr. LeRoy Naff and Mr. Sam Wilson, local landowners, that SCS personnel would be glad to explain to all landowners the details of getting a water-control project started.

The day before the landowners met there was a 9-inch rain!

"This was the heaviest rain to be expected once in a hundred years," said SCS engineers.

The day after the big rain, the 46 landowners met and elected LeRoy Naff president and W. C. Streeter secretary-treasurer of the informal organization called the "Ward Bayou Group Drainage Association."

At the first meeting, SCS technicians provided a tentative plan indicating locations of needed ditches and giving preliminary cost estimates. They explained that if enough interest were shown the Soil Conservation Service would make a detailed survey. After some discussion, the landowners signed an application for assistance with the Ashley County Soil Conservation District.

Their next step, after the preliminary survey, was to sign easements to allow each landowner access to an outlet and to talk over construction costs and make arrangements for funds to pay for the 250,000 cubic yard project involving 9.2

Note:—The author is area conservationist, Soil Conservation Service, Monticello, Ark.

miles of main ditches and laterals.

The preliminary cost estimate was \$39,400 for excavation and spoil-bank shaping, clearing, and bridge construction. The cost to individuals for access to the provided outlets was \$3.50 per acre of land benefited.

Local landowners say that rains with only moderate intensity cause annual losses of \$6 to \$10 per acre for replanting, late operations, and inability to properly cultivate and harvest. Annual benefits are figured at \$7 per acre, which will pay total construction costs of all drainage

systems within 2 years.

Since the project was on the county lines, the ASC county committees of both Ashley and Chicot Counties agreed to furnish \$9,600 each and the local people agreed to pay \$2 per acre. One-half the work was accomplished the last part of 1958; the remainder the first part of 1959.

A key item which made the Ward Bayou project possible was the recent construction of the Big Bayou outlet ditch by the U. S. Army Corps of Engineers.



Flooded farmland near Montrose, Ark., before drainage project was started. (Above.) The same area after the group drainage project was completed. (Below.)





# Grass-Based Rotations

—Serve Three Purposes

By H. E. VAN ARSDALL and ALBERT P. BOYD

**G**RASS production, as used by R. L. Price, is a "triple threat" practice in his conservation farming operation. Grass for feed, erosion protection, and soil improvement has proven itself on his farms in the Holmes Creek and Chipola River Soil Conservation Districts of Florida.

In carrying out his soil and water conservation plan, Price's first grass planting was made in 1945. This 65-acre Pensacola bahiagrass planting has grown to 500 acres. Along with this increase in grass his 13 head of purebred Shorthorn cattle have multiplied to 200 head of cows and heifers. During this period the sale of breeding stock has become an important part of his farming operations.

The earlier grass plantings were made on the sloping and poorer soils primarily for erosion control and cattle feed. In 1953, Price decided to

give his grass-based rotation idea a trial. Soil-building crops had been limited to winter annuals such as blue lupine and small grain. These crops were beneficial but weather conditions frequently limited their growth. Sod in regular rotation with cropland was a natural development in his soil improvement program.

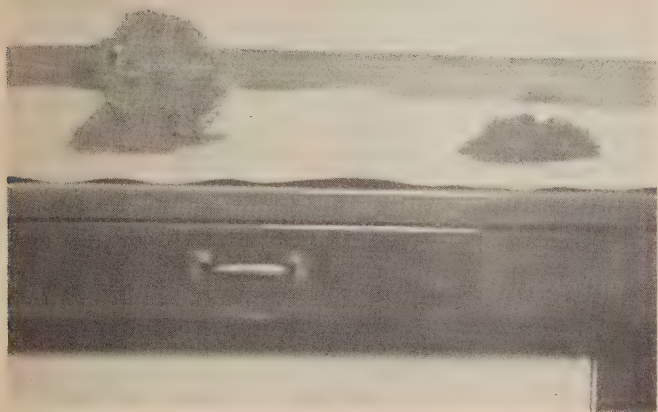
General farm crops are grown along with peanuts, the chief cash crop. The farm allotment of 90 acres of peanuts helps stimulate the best in a conservation cropping system. His system of 3 years or more in sod and 2 years of peanuts or other cultivated crops is balancing out his need for both grass and cultivated land. It has proven effective in increasing average yields. The best example of its value, however, came in a poor peanut year.

Price said, "In 1954, I had a 35-acre field of peanuts on old cropland that produced only 5 tons of nuts—a failure. The same year a field following sod produced 30 tons on 65 acres. Had it rained, we would have made a record yield on the sod land. We need practices that will save us from complete failure in poor years as well as give us increased yields in good ones."

Note:—The authors are, respectively, management agronomist and work unit conservationist, Soil Conservation Service, Lake City and Graceville, Fla.

Peanut crop following bahiagrass sod as part of a strip crop rotation on the R. L. Price farm.





Dried grass residue from 1 square foot, 7 inches deep, of soil on the R. L. Price farm (left) at the end of the first year of cultivation after plowing under Pensacola bahiagrass sod; (right) the residue from a similar field after 2 years of cultivation. The amounts of dried residue on these fields were about 500 pounds per acre after the first year and 250 pounds per acre after the second year of cultivation.

He pointed out the value of fertilizing the grass used in the rotation and remarked, "The feed produced by the grass in a rotation is as important as the return from a cultivated crop."

Thus grass is assuming importance as a soil improvement crop. Its value in producing livestock feed and preventing erosion has long been known. Its ability to improve soil is proving equally as important.

As a member of the State soil conservation board and State director of the farm bureau, Price's influence extends beyond the boundaries of his own district. Many visitors from other sections are impressed with conservation farming methods in use on his farms. The 1,400 acres of sod rotations in his own district is only an indication of his leadership in conservation farming throughout the state.

**SOLUBLE PHOSPHATES BEST IN BANDS.**—Research at the Michigan Agricultural Experiment Station shows that phosphate fertilizers with over 40 percent water soluble phosphate help plants more if they are placed in bands along the plant rows. The more insoluble phosphate carriers, however, are said to do a better job when broadcast and mixed with the soil. Where soluble phosphate fertilizers are broadcast, much of the plant food is tied up by reactions with soil minerals before the crops have a chance to use it.

## Hardboard plant waste as a canal sealant

A 1957 test study in Hood River County, Oreg., showed that hardboard plant waste effluent was effective in checking seepage from irrigation canals. The study was carried on cooperatively by the local irrigation district, soil conservation district, county engineer, a lumber company, and the Hood River Chamber of Commerce.

Volunteer labor hauled and pumped more than 200,000 gallons of the plant waste into a main canal of the Hood River Irrigation District. Built in 1910, the test canal had received loads of ashes, concrete, and various pulps in attempts to seal its porous shale surface, but to little avail until the hardboard effluent was used.

The finely divided wood fibers in the hardboard plant waste effectively sealed the canal. The test showed that approximately 800 acre-feet of additional water was made available to the district that season. This extra water was enough to make the difference between profitable crops and crop failures in years of critical supply, according to reports of the testing agencies.

A published detailed report of the test studies was recently made available to interested organizations by the Hood River Chamber of Commerce.



"GRASSES AND LEGUMES WILL KEEP US  
OUT OF MR. MCGREGOR'S CABBAGE PATCH!"



# Water Problems

—on Little Lost River

By BENNY MARTIN

**W**ATER always has been the major problem facing farmers and ranchers of Butte County, in southeast Idaho. The history of the area might well be written from the experiences of the residents in using the waters of the Big and Little Lost Rivers.

With the organization of the Butte Soil Conservation District in May 1953, the supervisors prepared a program and plan. Naturally they considered water conservation their major problem. With only limited storage on the Big Lost River watershed, and none on the Little Lost River watershed, water must be conserved in transportation, in the irrigation systems, and on the farms and rangelands.

To accomplish this, farmers and ranchers have worked together in many ways; swapping labor, sharing costs, providing materials and rights-of-way, and exchanging use of machinery. Some of these projects have received cost-sharing benefits from the Agricultural Conservation Program Service to assist in furthering the conservation of water in the district. Some projects have been financed entirely by the farmers and ranchers involved.

One of the first steps taken by the district, with the assistance of Soil Conservation Service technicians, was to establish snow survey courses on the Little Lost River watershed, to be used with the established courses on the Big Lost River watershed. These courses are used to prepare a forecast of the water supply on both watersheds. The district supervisors sponsor and conduct an annual water forecast meeting, at which time SCS technicians discuss the water supply outlook for the coming season, and the conservation practices which will enable the farmers and ranchers to make the most efficient use of available water during the season.

With the large watersheds of the district and only limited storage, farmers and ranchers are faced with the problems each year of peak flows that exceed storage facilities, flash runoff causing serious flood damage, and too much water at the wrong time. Recognizing their problem, the local people, with the leadership of Wendell Hansen, chairman of the board of the soil conservation district, and Emlen Mays, chairman of Water Users District No. 9, have made application for assistance under the Watershed Protection and Flood Prevention Act, P. L. 566.

Meanwhile, many temporary measures to control the water on the watersheds are being carried out, such as bypassing areas where water is lost in the transportation system, and installing temporary control structures on highly erodible streams having high peak flows for short periods.

Snow surveyors at work on the Little Lost River watershed.



Note:—The author is work unit conservationist, Soil Conservation Service, Arco, Idaho.



One of the old diversions and headgates on Little Lost River that needed replacement (above). The new diversion and headgate that replaced it (below).



Replacement and relocation of three river diversion and headgate structures in Little Lost River have brought benefits to 40 farms in the valley.

The work was done at a cost of \$18,140. This investment will be recovered from more efficient services during the next few years. The overall job was handled as three separate projects, each handled by a separate group of farmers.

Structures formerly installed in the stream had settled and become damaged by frost heaving. The sites had become overgrown with willows, which took up a large amount of water needed for production of crops on the 40 farms. Large amounts of silt and debris had accumulated around the sites.

Due to these and other handicaps, it had become difficult to divert a sufficient amount of water to meet cropping needs, or to obtain an

accurate measurement of the amount of water supplied to farms.

Action to remedy the situation was taken in 1955, when farmers and ranchers requested assistance of the Butte district in locating new sites and establishing new diversions and other necessary structures. SCS technicians did the planning, and work was started in the fall of 1956.

A feature of the construction now completed is the uniformity in design and construction of the diversion dams, headgates, and measuring devices. The structures are established at the same elevations to assure accurate measurement of water.

Revision of the irrigation systems on the farms is another important step in the conservation of water in the district. Installation of pipelines, division boxes, drop structures, and land leveling are all a part of this important program.

Methods of irrigation also play an important part in the water conservation program of the district. Sprinkler irrigation is being used on the rough lands and shallower soils. In surface irrigation, proper lengths of runs for individual soil conditions are being used. Furrow, contour, cross slope, border, or corrugation irrigation are being used as required.

The use of recommended adapted crops, planned rotations, and revised field layouts through farm planning also make up the job of water conservation on the farms of the district.

### ***Better weed killers for corn***

Field trials at the Wisconsin Experiment Station show that the new herbicides simazine and atrazine help control annual weeds in corn better than most chemicals now in common use.

A single application of simazine or atrazine, at the rate of 2 pounds per acre, was made soon after planting. This gave good early season control of both broadleaved and grassy weeds. A single cultivation after corn plants came up took care of the few weeds that escaped, and no further chemical treatment was needed.

Simazine and atrazine are more expensive than chemicals commonly used, but the advantages of fewer cultivations and higher yields from weed-free corn fields more than offset the expense, according to the Wisconsin agronomists.



# Rebuilding topsoil for the Island of Grapes

By VERN R. NELSON

**T**HE Island of Grapes, but for how long? Stretch Island, in eastern Mason County, Wash., has been known for its rich crop of Concord and Island Belle grapes for years. The making of juice and wines adds additional revenue to the county's total resources.

But as the years go by, yields from the once bountiful fields are slowly dropping. Field after field of grapes has been abandoned. Why? The climate has not changed, the rainfall is the same.

In 1958, the Mason County Soil Conservation District, then only a year old, became concerned. The district supervisors asked the local Soil Conservation Service technician to check on the problem. The technician went to Stretch Island and his first stop was at Robert Ellison's farm.

Ellison had purchased the place the winter before. As he and the technician walked to the grape fields, Ellison remarked that the soil fertility was low and the ground hard.

Between the rows of well-pruned grapevines on the sloping land, one thrust of a spade told a story which people too often overlook. The productive topsoil was gone! The grapevine roots reached just a few inches below the surface. They could not penetrate the hard subsoil. Winter rains no longer soaked into the soil, but ran off, carrying even more of the lifeblood of that field away.

The once fertile, friable topsoil, filled with billions of living microscopic organisms—bacteria, fungi, and larger organisms—was gone.

Ellison remarked that now he knew where that topsoil could be found. A few days earlier, he had been pruning grapevines on a lower, flat area. He noticed that the main grapevine stock had been pruned down to the ground. Checking closer, he found that the new stock was once a branch from the old stock. Seeing that the top-

soil was gone from his upper field, he now realized that the original grapevine had been completely covered by 2 feet of fertile topsoil, and a new main stock had to be pruned up to produce the new grapevines. The grapevines in the upper part of the field were starving while grapevines on the lower land were being smothered by topsoil washed from the upper fields.

The technician asked Ellison if he would consent to have 10 acres seeded to a winter cover crop to see whether or not heavy loss of topsoil could be stopped and fertility and structure rebuilt. Ellison agreed.

Ellison and the technician planned two types of cover crop—one for rapid, tall growth and one for rapid, low growth. They had in mind the growers who had only a disc to turn under the cover crop in the spring and needed a low-growing crop so they could handle it. Farmers who had equipment to turn it under could use the tall-growing cover crop.

Two mixtures were planned: Abruzzi rye, 70 pounds per acre, and common vetch, 30 pounds per acre for tall growth; Italian ryegrass, 10 pounds per acre, and crimson clover, 10 pounds per acre for low growth.

Ellison applied three sacks of 10-20-20 fertilizer per acre. The SCS plant materials center at Corvallis, Oreg., approved the field-size planting test and supplied the necessary seed.

Seeding was scheduled for September 15. As the time drew near, Ellison rototilled between the rows and disced in the fertilizer lightly. Both the vetch and crimson clover were inoculated. The vetch was mixed with the Abruzzi rye

Robert Ellison uses rototiller to turn under abruzzo rye and vetch mixture. Row at left is in crimson clover and Italian ryegrass.



Note:—The author is work unit conservationist, Soil Conservation Service, Shelton, Wash.

and clover with the Italian ryegrass. Each of the two mixtures was seeded between alternate rows of grapes. In the center of the 10-acre field four rows were left without a cover crop for comparison purposes.

Ellison and the technician watched the cover crop during the fall and winter. During heavy rainstorms, soil with the cover crop seemed to absorb water but on the soil without cover, heavy erosion and low absorption were observed.

Ellison believes that if the heavy loss of topsoil can be stopped, moisture retained longer, and fertility built up, he may produce as many grapes on half his acreage as he does now on all of it. Not only can Ellison produce more per acre, but other grape fields, now out of production, may again bring needed revenue to the farmer and strengthen the local juice and wine industry.

## A Soil Sample Display Panel

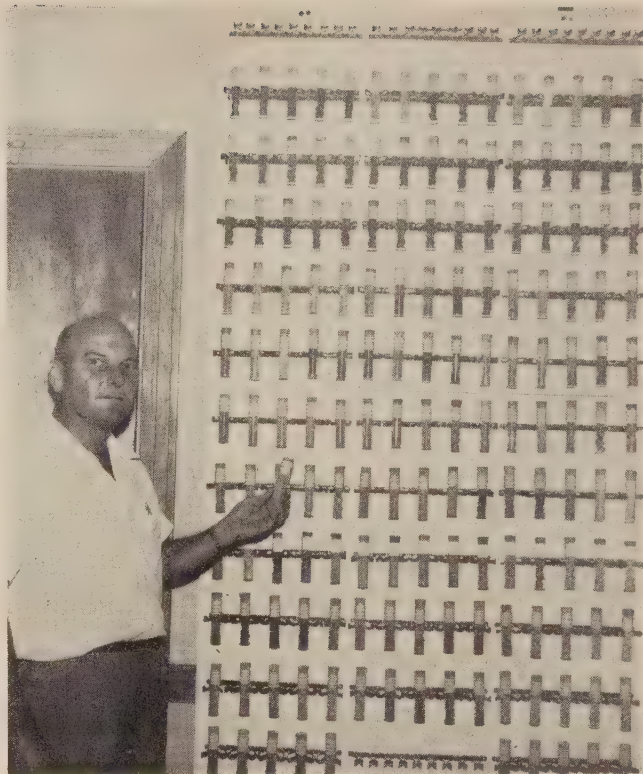
By LEON J. SISK

**S**AMPLING and describing soil profiles is an everyday part of the soil survey program. Vial samples of most of the soils in the country are on file in principal correlators' offices. A field soil scientist seldom has a problem in obtaining samples of soil horizons, but he has often run into trouble in trying to file or display such samples.

State Soil Scientist D. L. Fontenot of Louisiana was having such trouble, and he did something about it. He made a portable display panel that will accommodate most of the important soil samples of his State.

It is largely used for in-Service training but is also being used by SCS personnel in school and college classrooms and for other academic purposes to get more people to make greater use of soil classification.

Fontenot hinged two pieces of  $\frac{3}{8}$ -inch marine plywood, 36 x 40 inches, together to make a panel 72 x 40 inches when extended. Metal racks for rubber stamps were attached to the



D. L. Fontenot with his portable soil display panel.

boards to hold 4-inch, stoppered glass vials containing soil samples. Each rubber stamp rack holds five vials. There are six rows of racks on each of the two boards, with three racks in each row and each row 6 inches apart. This provides space for 180 soil samples.

The boards are painted white so soil colors will show up most effectively. The rubber stamp racks were obtained from the GSA supply catalog.

If inconvenient to hang on a wall, the boards can be folded to about 30 degrees and the panels displayed in the shape of a pup tent with soil samples on each side of the "tent" wall, for viewing from either side.

When the panels are to be transported by car to a meeting or for display, door stops are screwed into each of the four corners of one of the boards. The boards are then folded together, and the panels slipped into the trunk of the car where they rest on the door stops without damage to the rubber stamp racks.

The two boards, without the soil samples, weigh about 30 pounds and can easily be carried by one person. With the 180 samples attached the display still weighs under 75 pounds.

Note:—The author is information specialist, Soil Conservation Service, Spartanburg, S. C.



Handles are attached to each end of the panel so that it can be carried easily when folded.

Each bottle is labeled with a 1-inch white gummed sticker. Information is typed on the sticker: the name of the soil series, soil type, and depth of layer or horizon. The stickers also contain the genetic nomenclature of the soil and the mapping unit number. The labels also show by alphabetic number the county where the sample was taken. Since the samples are removed from the board when it is being transported or changed to make up arrangements of different soils for specific purposes, the information on the labels enables nontechnical personnel to arrange the samples on the board easily and in any desired arrangement.

The gummed labels could include land capability classification, engineering classification, and the soil productivity rating for various crops such as site-index class for a given tree species as well as its adaptability for the production of other crops.

The panel is easy to construct and the materials inexpensive. The benefits obtained from its use many times outweigh the cost of the panel. Additional information regarding the panel may be obtained by writing D. L. Fontenot, Jr., State soil scientist, SCS, Alexandria, La.



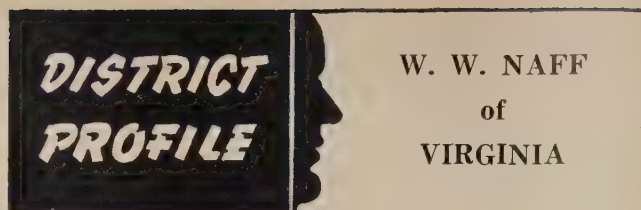
What happens to the corn land of the Corn Belt, the wheat land of the Wheat Belt, the cotton land of the Cotton Belt, the vegetable lands of the Southeast, the fruitlands of California, and other producing areas is eventually reflected in the business of New York, Chicago, San Francisco, Dallas, Atlanta, and Denver. What happens from day to day to the crops growing on these lands is reflected almost immediately in the big commodity exchanges throughout the nation.—Hugh Hammond Bennett in *THE HUGH BENNETT LECTURES* published by Agricultural Foundation Inc., North Carolina State College, Raleigh.



History proves that industrial development is unstable unless it rests on a broad adequate foundation of productive land.



In 1681 William Penn wrote an ordinance requiring that in clearing land, one acre in every five should be left in trees.



**F**OLKS who live in the rolling hills of Franklin County, Va. say nowhere in the Old Dominion has outlook for the land changed so remarkably for the better. "That's where the 'bare ribs' of the old Blue Ridge farm slopes were sticking out like a starving, wild hog's 20 to 25 years ago. Now look at 'em, sleek and fat," is a typical comment.

In truth, it takes a sharp eye to find a washed-out hillside, a naked gall spot, or a big gully scar in Franklin County. A lush, sod mantle protects the soil from woods to woods. Contoured ribbons of close-matted alfalfa and orchardgrass guard plowed fields during the rain. Curving terraces and green meadow strips take water leisurely to the creeks.

Ask any local farmer what happened and he will tell you about the Blue Ridge Soil Conservation District and, very likely, a gentleman named Wesley W. Naff, Sr. If you are lucky you just might catch up with Naff at his Retreat Dairy and Fruit Farm near Boones Mill. More likely, friendly Mrs. Naff might inform you that her husband is afield with other members of the Virginia Board of Agriculture, the State Soil Conservation Committee, or Association of SCD Supervisors.

When overtaken, Wesley gives a quiet account of the transformation—so quiet it adds drama to the tale: How he and other thoughtful farmers awakened to the reality that their lands were slipping out from under them with every rain. Then, they heard about the new soil conservation program and a camp of the CCC boys over at Chatham, and managed to get a camp established in Franklin.

Shortly, came formation of the Blue Ridge Soil Conservation District eventually straddling five hilly counties and embracing 3,663 farm cooperators. Wesley's life became that of an earlyday circuit-rider, carrying the message of the soil to farm meetings far and wide, working for stronger support from Richmond, seeking the best advice of agricultural brainpower centered at VPI in Blacksburg.

Meanwhile, there was the wife, five daughters and a son to care for, along with a herd of Holsteins, a 35-acre orchard, and 50,000 broilers a year. "I guess it's obvious—it *should* be—I couldn't have gotten around the way I still do, without Mrs. Naff backing me all the way," he confesses.

The Naff's conservation farming plan was in fact, a family plan. With it, they pioneered and helped introduce a whole catalog of soil and water practices to the Blue Ridges. They blanketed 125 acres with new, high quality pasture sod—so they could carry 60 cattle where they once carried 20. They set their acres of peaches and apples completely on the contour. They switched eroding corn fields to proper sites and by using conservation methods raised three times as much on less space.

They built two ponds and were among the first in the Old Dominion to irrigate peaches. Then too, they conserved enough water to satisfy 100 cows.

Working with the preachers at the Antioch Church of the Brethren, they helped instill a sense of soil stewardship that has become part of the conscience of rural communities throughout Blue Ridge country. This church is now a

rallying point for local conservation tours and in recent years has been host to a conservation tour of the Louisiana Bankers Association.

Wesley thinks that a man's first obligation is, of course, to his family and church; secondly, he thinks, comes the responsibility of leaving the land as good, or better than he found it for those who follow. Actually doing conservation farming is important, but even more so, in Wesley's mind, is influencing neighbors and others to do so. "This", he says, "helps the whole community, county, district, and state to improve. The greatest reward I can receive for giving time to the conservation cause is the satisfaction that saving the land is the second most important thing a man can do, along with radiating that influence to others, both old and young."

Wesley's voice, familiar to Virginia soil leaders for two decades, was recently heard on a statewide radio network. Said he, "Small watershed projects, with their overriding benefits, have attracted more town and city people to soil conservation than any approach we've known thus far. As more people move to the city the need for the broad conservation program increases."

The voice of Wesley Naff is also heard in Washington. Since last fall, he has served on USDA's Soil and Water Conservation Advisory Committee.

—WILLIAM D. RICHARDSON

Mr. and Mrs. W. W. Naff.



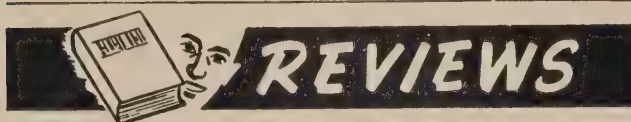
### ***Planning reduces highway costs, checks erosion***

By advance planning in connection with his conservation farm plan, Bryce Vollmar, Ida County, Iowa, obtained a double benefit from new highway construction and saved money for himself and the public.

When highway engineers planned a new highway across the south end of his farm, Vollmar asked that five culverts be placed higher than usual so they would impound water. He signed an agreement and gave an easement for the land which the ponds would cover. Since the higher culverts could be shorter, the Highway Department saved money and Vollmar obtained five farm ponds and checked erosion in five gullies. Vollmar is a cooperator with his local soil conservation district and the land above the ponds is stabilized with terraces, contour farming, and waterways. The ponds also supply water for livestock in his pastures.



CHANGE OF ADDRESS SHOULD INCLUDE ZONE, OLD ADDRESS, AND CODE NUMBER



**EFFICIENT USE OF FERTILIZERS.** Revised. Edited by Vladimir Ignatieff and Harold J. Page. 355 pp. Illus. 1959. FAO Agr. Studies No. 43. Columbia University Press: New York. \$4.

**T**HE first edition published in 1952 has been extensively revised and enlarged. Like all publications of Food and Agriculture Organization of the United Nations, it is available in English, French, and Spanish.

The chapters include The Role of Fertilizers, Plant Nutrients, Organic Matter, Commercial Fertilizers, Factors Affecting the Use of Fertilizers and Manures, Time and Method of Fertilizer Application, Cropping Systems and Fertilizers, Plant Nutrient Relationships to Soil Regions, Crops and their Soil and Nutrient Needs, Economic Aspects, and The Farmer and Agricultural Services.

The book is intended for agricultural planners, advisers, teachers, and others who work with farmers and farm organizations. It presents the most important information from the world viewpoint, and would be of particular value to Americans taking their first foreign jobs, and to teachers who wish to give their students the basic elements of tropical agriculture.

—GUY D. SMITH

New Hampshire was the first State to complete its inventory of soil and water conservation needs.

**IRRIGATION ON WESTERN FARMS** is the new Agriculture Information Bulletin No. 199 that was issued cooperatively by the Soil Conservation Service and the Bureau of Reclamation. This outstanding publication was prepared by L. R. Swarner, Maurice N. Langley, and John T. Maletic of the Bureau of Reclamation and John T. Phelan, L. F. Lawhon, Dell G. Shockley, and Ralph H. Brownscombe of the Soil Conservation Service.

Use of larger farm machinery and farm labor shortage create new problems in planning terrace systems.

Some farmers in states such as Kansas, Nebraska, and South Dakota are using contour bench leveling to control erosion on irrigated lands.

### *Advisory group commends watershed program*

The U.S. Department of Agriculture's 18-man Soil and Water Conservation Advisory Committee, including representatives of various interests across the country, in a recent meeting in Washington, commended the watershed protection and flood prevention program.

The committee pointed out that the watershed program is one in which urban people can join with soil conservation districts and land operators in resource conservation programs of real value to the entire public.

It urged the Department to give continuing emphasis to scientific soil and water conservation, with the greatest possible participation by State and local governments and local people, as a means of meeting future crop and water needs at the lowest possible production costs. Here again it emphasized mutual benefit to city people as well as farmers and ranchers.



**FEBRUARY  
1960**

# Soil Conservation

Soil Conservation Service • U. S. Department of Agriculture



# SOIL CONSERVATION

EZRA TAFT BENSON  
SECRETARY OF AGRICULTURE

DONALD A. WILLIAMS  
ADMINISTRATOR, SOIL CONSERVATION SERVICE

OFFICIAL ORGAN OF THE SOIL CONSERVATION SERVICE  
U. S. DEPARTMENT OF AGRICULTURE, WASHINGTON, D. C.

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TOM DALE, Editor

SOIL CONSERVATION is published by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business. The printing of this publication has been approved by the Bureau of the Budget, June 26, 1958. SOIL CONSERVATION supplies information for workers of the Department of Agriculture and others engaged in soil conservation.

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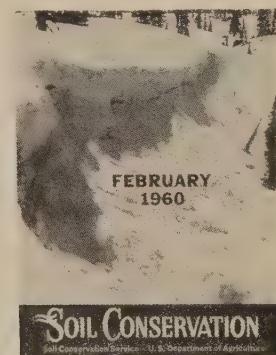
**BALING GRASS SILAGE.**—A year of tests with baled grass silage at Minnesota experiment stations indicates that this may be a practical way of dealing with wet hay crops.

In the tests, the hay was baled with 35 to 50 percent moisture content. The bales were closely stacked on one end of a sheet of plastic. The plastic sheet was then pulled over the stack and the ends and edges covered with enough soil to make the entire stack airtight.

Wherever the plastic sheets were not punctured, the baled silage was still good when the stacks were opened for winter feeding. In one test the total dry matter losses were less than 5 percent.

In all tests, however, the baled silage had some white mold on it, due to the trapped air in the plastic bags at the time of sealing. But apparently this mold did not affect the quality of the silage and may have improved its palatability, since cattle seemed to relish it.

The silage spoiled, however, where the plastic was torn or punctured. There were also problems in opening and feeding the silage. Once the plastic was opened the entire surface was exposed to air and hence created a spoilage problem if the temperature rose above 40 degrees.



FRONT COVER.—Snow drift near McKenzie Pass in Deschutes County, Ore.

All orders go to the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

# Water Diversion Through Snowbanks

By Carl Wilker

THE problem of bringing water economically through snow banks, sometimes 20 to 30 feet deep, to irrigate Utah's Sanpete Valley has been solved by using 6-inch perforated metal pipe. As a result, several irrigation companies now are supplementing their water supply by canal diversions from the Colorado River Basin to the Sanpete Valley. These transmountain canals lead melting snow water from the east slopes through mountain passes or tunnels at elevations of approximately 10,000 feet. In some instances this is the only water available for land that has been irrigated by transmountain water since the 1860's.

Many thousands of dollars were spent by the Mormon pioneers who developed these transmountain projects. Descendants of the early pioneers state that nearly a quarter million dollars was spent by a few individuals on the less than half a mile long Larsen tunnel above Ephraim, Utah. The largest tunnel in the area is the Ephraim tunnel, nearly a mile long, that was constructed with financial and technical assistance from the Bureau of Reclamation at a cost of approximately one-half million dollars.

Canals leading to the tunnels and low mountain passes are several miles long in some instances. Most of the canals were dug with 2 to 3 percent grades, cutting across slopes and natural drainageways where they intercept runoff from melting snow. The initial construction was done by hand labor or with horse-drawn equipment.

In early spring when temperatures permit thawing, snow begins melting rapidly on the south and west slopes, canals begin filling in the early afternoon, and snowbanks lying across canals must be opened or water overtops the

canal banks. When a canal breaks the entire stream may be lost for several days in addition to the severe erosion damage that is caused by the break. The only practical method of repairing these canal breaks at this time of year is by manual labor, and the laborers usually must climb several thousand feet on foot or by horseback to get there. But the canals must be opened and breaks repaired, since the crops in the valley 5,000 feet below begin thirsting for water around June first. These melting snowbanks are their only source of water, and when they are gone the fields remain dry until the following spring.

Farmers tried many devices through the years to open these canals through the snowbanks in early spring. Logs were anchored to



Planks and poles were used in this diversion canal to prevent its being clogged by snow drifts.

Note:—The author is work unit conservationist, Soil Conservation Service, Manti, Utah.



the banks of the canals by wire in hopes the melting water would follow the log and open a hole through the snow. Some companies covered the worst drift sections of their canals with lumber slabs or planks. One company used 6-inch wooden pipe, such as was commonly used in some of the early city water systems. Another company constructed square wooden boxes (approximately 1 foot by 1 foot) in 12- to 16-foot sections and fitted the sections end to end.

These methods were all helpful but many man-hours were still spent shoveling snow and working the water through the drifts by hand labor. Water was late getting to the tunnels on years when snow was deep and hundreds of acre-feet of water were lost to the Sanpete farmers.

In 1955, a large irrigation company applied to the Sanpete Soil Conservation District for technical assistance on its snowbank problems. SCS engineer Thomas M. Brothersen and I visited the problem area with Evan C. Larsen, then president of the irrigation company. Their canal, located on what is called Horseshoe Flats, was inspected from the Larsen Tunnel eastward to the beginning of the canal. Problems were discussed and a conservation plan was worked out with the company.

Easements and rights-of-way were cleared with the Forest Service, and an agreement was reached to begin improvement of the canal. One section of the canal was surveyed and found

Wooden box pipe used to carry early runoff through snow banks.



Twenty-four-inch metal pipe installed in Olsen's Canyon by a large irrigation company to lead water through snow drifts.

to be too flat, so a new channel was recommended by SCS and constructed by the company to obtain better gradient.

SCS technicians in the district knew of no former experience or methods prescribed to get the water through the snowbanks, but agreed on Tom Brothersen's recommendation that metal pipe should solve the problem. The size pipe to use was based on the capacity of the canal, and a spillway to control this capacity was installed at the head of the pipe. Accordingly, 630 lineal feet of 24-inch galvanized, corrugated metal pipe was installed by connecting each 20-foot section with metal bands and laying it in the bottom of the new canal. This canal was on an east slope where the deep drifts accumulated.

Performance of this pipe was checked early during the 1956 spring thaw. The method worked and, for the first time in years, a good stream was coming out early from under several feet of snowbank.

Observations were made by SCS technicians and findings were discussed with members of the irrigation company board. It was noted that a tunnel larger than the 24-inch pipe had opened up through the snowbanks. Indications were that smaller pipe could be used and would do the job. We now reasoned that 6-inch galvanized, perforated metal pipe should open up the channel by leaking water along the canal bottom, thus melting the snow and opening the

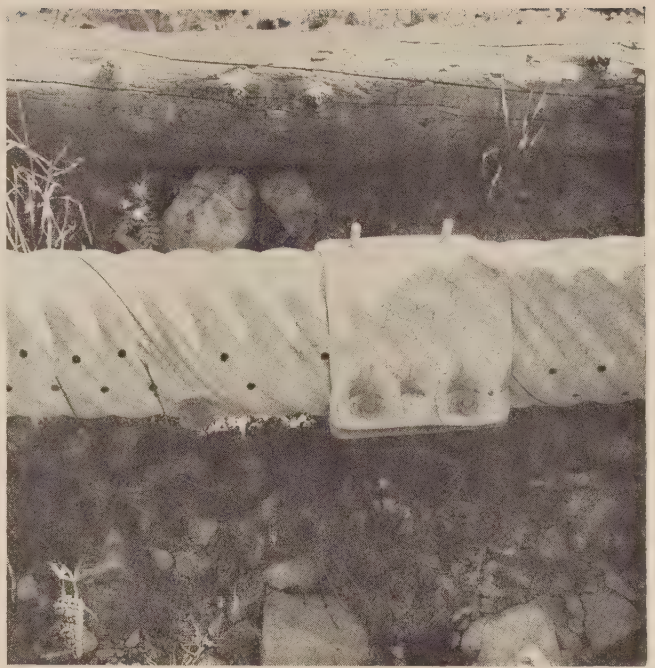


channel for a stream to flow through the snow-bank. Once a small channel was open the stream of water from the melting snow should rapidly open the channel to full capacity.

The ideas and results were explained to a local canal company, which operates a canal system in the same general area. This company, with SCS technical assistance and ACP cost-sharing provided by the County Agricultural Stabilization and Conservation Committee, installed 2,000 feet of 6-inch perforated pipe in the fall of 1956. This pipe was located and placed in critical sections of the canal which were spotted and staked the preceding spring while the snowbanks were still in place.

This 6-inch perforated pipe seemed as effective in getting the water through the banks as the larger pipe. It also had the advantages of being much cheaper and easier to transport into this high, rough, mountainous country. However, such pipe must be properly located and supported in the channel to prevent silting up and to prevent crushing from the settling snowbanks.

Several irrigation companies now are using this method to lead water through deep snowbanks. Advantages, as expressed by them, are: (1) labor to get water through the banks is eliminated almost entirely if pipe is properly installed; (2) water can be brought through tunnels as much as 2 weeks earlier in the spring; (3) erosion of canal banks and steep mountain slopes caused by canal breaks is re-



Perforations in 6-inch metal pipe permit water to escape and melt the interior of snowbank, thus opening channel for canal stream flow.

duced almost 100 percent; (4) canal maintenance costs are greatly reduced; and (5) more water is provided to the stockholders of the companies.

### *What is water worth?*

Water is a commodity so precious that no tyrant has ever dared deny it to his people. The earliest records of our civilization are linked to the spring and the waterhole, the river, and the well.

Wars have been fought over water rights and once-mighty nations have vanished because their water resources failed. Men have battled to the death over the last few drops in a canteen. Formidable fortresses, impregnable in other respects, have fallen because of an insufficient water supply.

Ships' masters have had to risk the destruction of their vessels and the slaughter of their crews because water shortages forced landings on savage isles. Families have given up their homes and deserted their properties because of failing wells and dried-up watercourses. London was virtually destroyed by fire in the 17th century and Chicago reduced to ashes in 1871 because sufficient water could not be delivered to the right place at the right time.

What is water worth?

Water is beyond price—so far beyond price that water is free of all price.

*Reprinted from What Price Water?  
American Waterworks Association.*



Six-inch perforated metal pipe, in Horseshoe Flat diversion canal, that is held in place with steel posts.



# Should You Let The Grass Grow?

By A. A. Hanson

**H**OW much, how often, and when should you mow or graze perennial grasses to get maximum forage production and still maintain vigorous future growth? The answers vary according to the kind of grass, the climate, soil, type of use, and other factors. No set of answers will fit all situations.

The perennial grasses form the basis of our natural and seeded ranges and pastures and are major constituents in most hayfields. They are important as livestock feed and make direct and indirect contributions to erosion control, improved soil fertility, landscape beautification, and wildlife cover. Yet these plants, by virtue of demands for livestock feed or for close, frequent mowing, often serve as one of our best examples of man's many attempts to have his cake and eat it too.

Most crop plants complete all or a substantial part of their life cycle before being harvested. On the other hand, the perennial grasses may be harvested or clipped not once, but several times during a single growing season. In addition, they are expected to persist and maintain their productivity year after year. All too frequently these plants are utilized with little or no attention to the season of the year, fertility requirements, drainage needs, drought conditions, and intensity of defoliation. Have we any

Note:—The author is research agronomist, crops research division, Agricultural Research Service, Beltsville, Md.

## No. 51

This is the fifty-first of a series of articles to appear from time to time in explanation of the various phases of research being conducted by the Department of Agriculture on problems of soil and water conservation.

reason to wonder, then, at the poor stands, erosion conditions, weed invasions, and low yields that are encountered on so many grassland acres?

Substantial improvement can be made through the choice of species and varieties for reseeding, by the use of fertilizers, and by good drainage. Nevertheless, we are left with the paradox that our returns from grasslands, whether they be beef or beauty, depend on grazing or clipping the grass during the growing season; yet this defoliation may be to the detriment of thick stands, total yield, and erosion control value.

It is obvious, therefore, that proper management of the perennial grasses depends on a thorough understanding of the effects of top-removal on subsequent growth and development. The following remarks will be confined to some of the major factors influencing recovery following top-removal, for the simple reason that space does not permit an exhaustive review of these complex and somewhat poorly understood phenomena.

The rate of recovery after harvesting or mowing is a function of two sets of variables: those reflecting the condition of the grass plant, and those associated with the environment in which it is growing. The plant factors are: (1) the amount of leaf area (photosynthetic surface) that remains after clipping or grazing; (2) the amount and location of reserve substances (carbohydrates stored in the roots, at the base of the stems, or in stolons or rhizomes); and (3) damage or removal of the shoot apex (the growing point that eventually becomes reproductive and develops flowers and seed). The environmental factors include moisture, soil fertility, temperature, and light.

Any one of these may have a significant influence on regrowth, depending on the species, frequency of defoliation, and height of cutting or grazing. However, the level of reserve sub-



stances in the grass at the time of defoliation is of primary importance to subsequent plant response.

The grass plant is placed under stress as soon as the top growth is removed. The basic significance of reserve substances to regrowth and survival is not unlike the situation prevailing when grasses are exposed to unfavorable environmental conditions. Thus, the success with which dormant grass plants survive periods of low temperature or extreme drought is determined somewhat by the level of reserve materials.

Leaf expansion following complete defoliation is normally at the expense of stored reserves. At the same time, root growth ceases until the photosynthetic area increases and sufficient carbohydrates are manufactured for root development. Under some circumstances as little as half as much soil moisture may be available to defoliated plants as to nondefoliated, transpiring plants. Reduced root activity prevents extension of roots into regions not already depleted of soil moisture and also reduces the uptake of mineral nutrients.

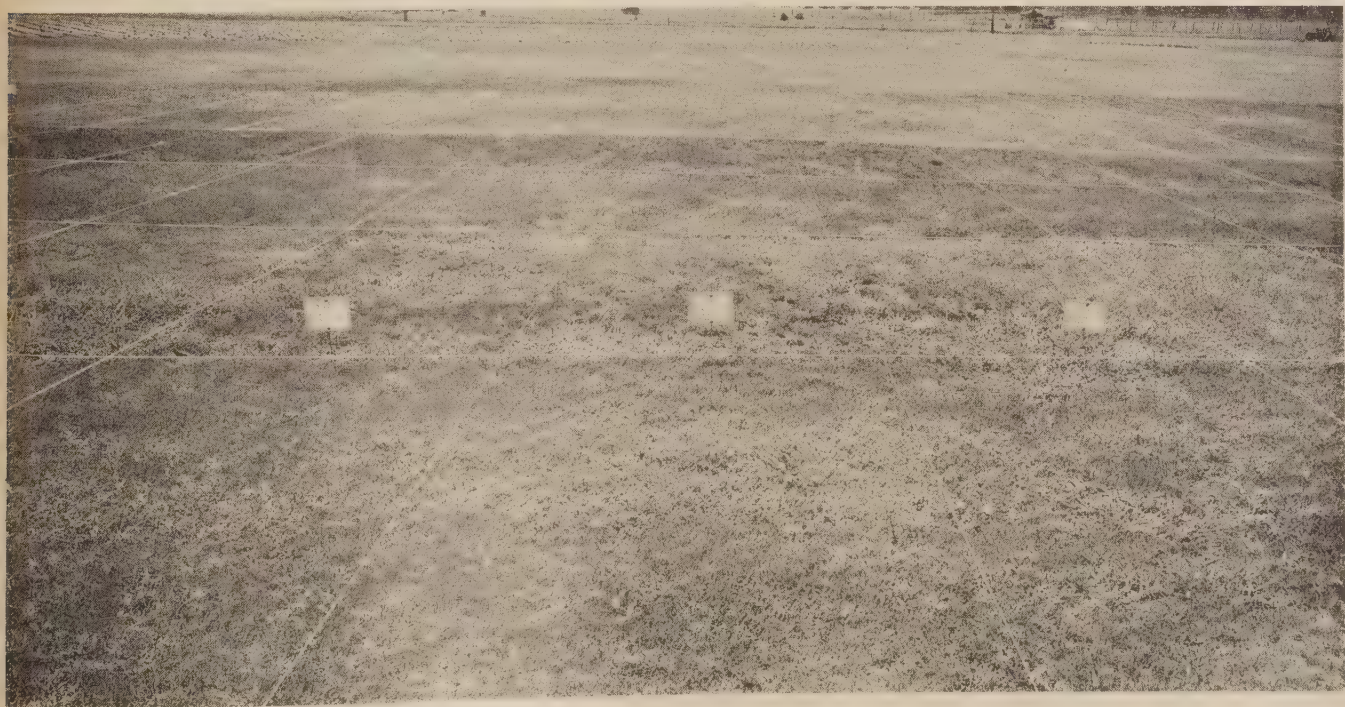
The stem dies when the shoot apex is removed by grazing or mowing. New growth must come either from buds located at the base of

the stem or from rhizomes, stolons, or roots. Under field conditions, loss of the shoot apex from erect growing grasses may remove a much larger portion of the photosynthetic area than utilization of similar plants without loss of the shoot apex. In addition, removal of the shoot apex may coincide with a period of low reserve substances. If this is true, then the growth of new buds will be slow or the plant may die because of insufficient reserves, reduced root development, and the associated lack of moisture and nutrients.

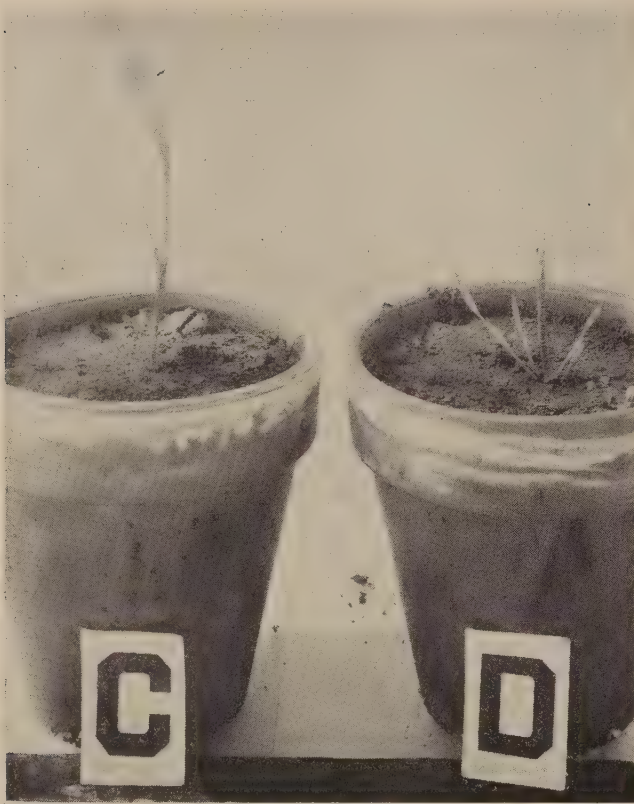
The amount of photosynthetic area left after clipping or grazing will determine the need for and amount of reserve substances used to initiate new growth. Complete defoliation of a low-growing species like Kentucky bluegrass is practically impossible unless cutting is very close and at infrequent intervals. Kentucky bluegrass and such low-growing species as carpetgrass, bermudagrass, and buffalograss can maintain sufficient foliage under moderately heavy use to accumulate adequate reserves. The buildup of reserve substances cannot be taken for granted, however, even in a low-growing species.

For example, the top growth of Kentucky bluegrass can be overstimulated in late spring

Kentucky bluegrass-red fescue mixture test plots on height of mowing and fertilizer treatment effects. Thin turf in first tier of plots is due to close mowing or to close mowing plus overstimulation with nitrogen. The superior stand in second and third tiers was obtained from higher mowing.







Completely defoliated smooth brome tillers, showing type of recovery when shoot apex is not removed (C) and when shoot apex is removed (D).

by heavy applications of nitrogen, and then the frequent mowing necessitated may retard the accumulation of carbohydrate reserves and root development. Under these circumstances, loss of stand can result from lack of sufficient reserves to maintain plants through periods of drought and high temperature.

There are also wide differences among varieties as illustrated by the comparison between the low-growing Merion variety and common Kentucky bluegrass, or by the comparison between a turfgrass variety of bermudagrass, such as Tifgreen, and the forage variety, Coastal.

The relationship of top-removal to photosynthetic area cannot be considered without reference to the location of reserve substances. In many species (e.g., crested wheatgrass and orchardgrass) a substantial amount of the reserves is stored in the stem bases and may be removed in part by very close clipping or grazing. Reserves stored in roots, rhizomes, and stolons are protected from this hazard.

Reserve substances can compensate to a large degree for the loss of photosynthetic area, re-

moval of the shoot apex, and cessation of root growth caused by top-removal. If water management and soil fertility practices are improved insofar as practical, then a knowledge of reserve substances, when they are accumulated, and when they are at critically low levels holds the key to sound management practices.

In many grasses the maximum level of food reserves is reached either after stem elongation has ceased or at maturity. Thus, reserve carbohydrates in purple needlegrass accumulate as the growth velocity decreases, at or near the end of the annual growth cycle. The pattern is very similar in mountain brome, slender wheatgrass, johnsongrass, and vaseygrass. In little bluestem, organic reserves in the roots usually decrease up to the time of flowering. Reserves accumulate in timothy during the growing season, reach maximum levels at blooming, and then remain fairly constant until late fall when they start to decline. In the fall, carbohydrate reserves increase in Kentucky bluegrass and orchardgrass.

Reserves in the perennial grasses are usually low in the spring as a result of depletion during the winter. Rapid spring growth, coupled with little or no basal leaf development, does not permit the restoration of reserves. Hence, species with this growth pattern are invariably subject to damage from heavy spring use. Grasses in this category are meadow fescue, tall oatgrass, and purple needlegrass.

In early spring other species, such as smooth brome, may form a rosette of basal leaves which will permit the restoration of some reserves during cool weather. Stem elongation occurs very rapidly, however, and apparently utilizes reserve substances in the process. Therefore, the critical period for smooth brome is rather short and appears to be closely associated with the elongation of the lowest internode of the stem.

The success of crested wheatgrass in the Northern Great Plains and Intermountain Region can be attributed in part to its strong ability to maintain high reserve levels in roots and stem bases even though root growth, total yield, and plant size are reduced by top-removal.

Orchardgrass, tall fescue, Russian wildrye, blue grama, Coastal bermudagrass, and Pensacola bahiagrass are adapted to very different environmental conditions. Yet they represent

species and varieties in which reserve substances can be maintained during the growing season when the plants are subjected to periodic grazing or clipping. They differ markedly from species in which reserve substances remain at relatively low levels until late in their growth cycles. These latter species may be severely damaged by what would be considered moderate use during the vegetative stage, especially if such use coincides with drought periods.

What happens when the perennial grasses complete their seasonal growth cycle without clipping or grazing? In general, grasses subject to damage from top-removal maintain stands and appear to perform very satisfactorily. On the other hand, grasses that can tolerate some degree of defoliation may perform much better if they are clipped or grazed. This is particularly true in humid regions where the presence of mature foliage and accumulated litter contributes to the buildup of insect pests and disease.

It all adds up to this: you must know your grasses and the environmental factors involved before you can make sound determinations as to how much, how often, and when to mow or graze.

# Latar Was The Answer

By Leonard A. Anker

THE supervisors of the Carson Valley Soil Conservation District had heard that "Latar" was one of the best grasses that Soil Conservation Service agronomists had developed at the nearby plant materials center, and they wanted someone to try out this variety of grass. They wanted a first class farmer with some Class I land, so they looked up Frank Settlemeyer and his son, Marvin, who operate an 80-cow dairy near Genoa, Nev. If this new variety of orchardgrass was as good as they had heard, it could really help farmers in their district, they figured.

Note:—The author is work unit conservationist, Soil Conservation Service, Gardnerville, Nev.



Marvin Settlemeyer displays cuttings of common orchardgrass, alfalfa, and Latar orchardgrass made at the time common orchardgrass had formed seed heads. The alfalfa and Latar are still in vigorous growth and will be ready to produce optimum hay yield at about the same time.

Orchardgrass is seldom grown alone. A favorite combination for dairymen is orchardgrass planted with alfalfa. Many dairymen, like the Settlemeyers, say it makes a better feed, helps prevent bloat, and is about the most palatable grass that can be grown on irrigated lands. That is, it's palatable if cut for hay before it gets too old and coarse. But that was a fault of common orchardgrass. When planted with alfalfa it matures a couple of weeks before the alfalfa is ready to cut. Many farmers say they were faced with this dilemma—should they cut the alfalfa before it's ready, or should they let the orchardgrass go and cut it when the alfalfa is at peak quality.

Darwin Anderson, SCS plant materials technician working in Nevada, told them that Latar orchardgrass was the answer. "It will mature about 10 to 14 days later than common orchardgrass and should be ideal to plant with alfalfa," he said. So they called on the Settlemeyers to prove it. They did just that.

About 6 acres of Latar orchardgrass were planted alongside a larger field of common orchardgrass in the fall of 1956. Both were seeded with alfalfa. The Latar field looked good in 1957, and when we saw the crop in 1958, we knew we had picked the right farmers and the right grass. It was just as pretty a





Chopped alfalfa and Latar hay being fed to the milk cows on the Frank Settlemeyer & Sons farm.

field as you'd want to see—thick as hair on a dog's back.

Not only that, but these good dairymen know that quality hay is not measured in pounds but in the amount of milk cows give. The Settlemeyers don't sell hay. Their money comes from their milk checks.

"Latar orchardgrass matured right along with the alfalfa, and it seemed to be quite a bit leafier, too," Frank Settlemeyer mentioned.

The Settlemeyers even learned something the SCS technicians didn't think of. They cut their hay with a windrower. Each time the reel in front comes around, it throws the grass pollen back near the operator. Marvin told us that there were times when he was just yellow—covered from head to toe with pollen. That is, with the common orchardgrass. With the Latar variety there was much less pollen because it matured later. What a boon that could be to anyone who has hayfever troubles.

## Grass Makes the Difference

—in Rainfall Penetration of Grazing Land

By Leon J. McDonald

THE amount of grass on rangeland makes a big difference in the amount of runoff and insoak from flash rains, in the opinion of I. C. Thurmond, Jr., of Elk City, Okla. And he has observations and measurements to prove his point.

Thurmond operates the 11,400-acre Red Rock Ranch northwest of Elk City. He has been a cooperator with the North Fork of Red River Soil Conservation District for years. He nearly always confers with SCS range conservation-

ist Fred Whittington before making major changes in his ranching operations. And he is beginning to see his conservation ranching methods pay off.

Native grasses, such as sideoats grama and the bluestems, blanket most of the ranch. The grass is getting thicker and taller on most of these red shale hills year by year. The cowherd looks thriftier and the calves are heavier at weaning time. Thurmond has seeded 2,500 acres of formerly cultivated land to native grasses in recent years.

Most of Red Rock ranch lies within the Sandstone Creek watershed protection and flood prevention project. Some of the drop-

Note:—The author is assistant State conservationist, Soil Conservation Service, Stillwater, Okla.



inlet structures and floodwater detention dams are on the ranch. Thurmond visits these sites frequently and has observed that the water runoff is less since he started his grass management program. The water in the lakes is clearer than when they were built in the early 1950s. The rancher knew that "grass made the difference" but he did not know how much difference. He wanted to know, and the matter usually came up for discussion when he and Whittington got together.

He did not have to wait long before Whittington had convincing proof of the value of a grass cover on the rate and amount of infiltration. One night, 1.65 inches of rain fell in a 1½-hour period. Whittington and Dent Burgess, SCS soil scientist, got Thurmond and drove out to the ranch to check on runoff and infiltration.

The men found an area typical of the ranch, where the amount of grass cover varied greatly. Whittington and Burgess took turns digging holes with a sharpshooter spade while Thurmond looked on. The results were soon evident and amazing.

On Site (1) where the range was in Poor condition and grass cover was sparse, the moisture had penetrated only 3 inches. There was evidence that most of the water had been lost through runoff.

At nearby Site (2) where the range was in Fair condition, the insoak penetrated to a depth of 10 inches. There was little evidence of runoff from this area.

Nearby, Site (3), a dense stand of sand blue-stem in Excellent condition, showed a moisture penetration of 30 inches.

Thurmond looked and believed what he saw. There was convincing evidence that the amount of grass cover and the depth of moisture penetration were closely related; the greater the amount of cover, the greater the depth of moisture penetration.

In the limestone area of southern Oklahoma, Chester Fry, SCS range conservationist, made similar findings near Ardmore. On a range in Poor condition and badly overgrazed, Fry found the water intake was only 4 inches in a 2-hour period of steady rainfall. The intake was 1.2 inches the first 15 minutes of the test, but only .2 inches the last 15 minutes of the period.

The intake was 10 inches in the same 2-hour period on a nearby range in Excellent condition

and properly grazed. The rate of intake varied from 2 inches the first 15 minutes to 1 inch the last 15-minute period.

Fry also found that the amount of cover on the land influenced the temperature of the soil. On the range in Poor condition, the soil temperature—2 inches below the surface—was 135°F, as compared to a temperature of 95°F, on the site in Excellent condition. The air temperature was 105°F. at this time.



On Thurmond range in Poor condition moisture penetration was only 3 inches after 1.65 inches of rainfall (above), while moisture penetrated 30 inches on range in Excellent condition (below).





# A Part-Time Farmer

## *Builds up a Rundown Farm*

By Edward G. Konieczny

**R**EVIVAL of a rundown farm on a part-time basis was a challenge to William W. Hamilton, a machine shop worker of New Salem, Mass. His family felt the challenge, too. The 130-acre farm, obtained in 1946, consisted of 25 acres of orchard, 90 acres of woodland, and 15 acres of idle land.

"Putting the farm into production so that I'd have a reliable supply of fruit to sell was my first job," Hamilton recalls. "I had always hoped that I could market my fruit on a 'pick-your-own' basis but I had to have the fruit to keep the customer coming back. That's where the Soil Conservation Service came into the picture. In 1953, with the help of the SCS technician assigned to the Franklin Soil Conservation District, I made a soil and water conservation plan for the farm. The soils map helped by showing me where the different kinds of fruit would grow best."

Note:—The author is work unit conservationist, Soil Conservation Service, Greenfield, Mass.



William Hamilton checks mulch and growth in his contoured strawberry bed.

Hamilton started work on making the idle land productive by installing 1,035 feet of diversion ditches. They prevented excess water from flowing across the 15-acre sloping field. He built the ditches with his farm tractor and plows. SCS technicians checked the grade of the diversions periodically as Hamilton plowed them in the evening after his day's work at the machine shop.

He seeded Kentucky bluegrass, redtop, and white Dutch clover when the completed diversions were ready to do their job. He seeded green manure crops of red clover, alsike clover, and timothy between the diversions to increase soil organic matter. After turning the green manure crop into the soil, he planted 3 acres of peaches and pears, 2 acres of strawberries, and 1 acre of raspberries on the contour. He rotates 4 acres of strawberries and vegetables every 2 years with green manure crops.

"Contouring and mulching help a lot in conserving water in the Gloucester fine sandy loam soil that makes up the farm but the crops need some additional water during dry seasons," Hamilton said. So he built a quarter-acre pond for irrigation of small fruits. The four Hamilton children, 4 to 11 years of age, enjoy swimming and wading in the pond during hot summer days. Mr. and Mrs. Hamilton watch out for their safety.

The Hamiltons now market their fruit from spring until frost. Mrs. Hamilton takes charge of the "pick-your-own" customers. They harvest 95 percent of the fruit produced on the farm. Hamilton's conservation work has helped increase apple yields from 2,000 to 6,000 bushels. Strawberry yields are 5,000 quarts. The raspberry crop last season yielded 2,000 pints.

"We plan to continue expanding our operation," Hamilton said. "The children are growing up and help a lot. Thanks to my soil conservation plan, I now have the fruit production I need to assure steady and repeat patronage."





Contour stripcropping without terraces on the Charles McIlwain farm in Abbeville County, S. C.

## No Terraces—Just Contour Strips

By Brice M. Latham

**C**HANGE—that's what you will find taking place continually in the soil and water conservation program. And that's what you will find on the Charles McIlwain farm in Abbeville County, South Carolina, where there isn't a single terrace—they used to be there, but have been eliminated. Contour strip rotations, with strips 72 feet wide, are used instead of terraces. Every other strip is in small grain. This system gives adequate rotation to protect the Class II land and at the same time, if properly laid off, will give all long rows.

Mr. McIlwain says, "If you are not going to follow a good strip rotation that will protect the land, you had better stick to terraces." McIlwain has been following this system for 3

years and he likes it fine. He says, "I wouldn't go back to the old system. I put in 20 more acres this year." McIlwain is a cooperator of the Abbeville County Soil Conservation District and a conservation aid with the Soil Conservation Service.

With the parallel strips, McIlwain uses every natural depression for a grass waterway. The acreage used, however, is less than that originally used in conventional meadows. The meadows used for drainage are small and the cultivating equipment can cross them without difficulty. He just elevates the plow blade when he comes to one, crosses the meadow and continues the cultivation of the crops.

"This system of contour strip rotations without terraces is a farmer's dream," says McIlwain. "No terraces to cross, no terraces to maintain, and all long rows."

Note:—The author is area conservationist, Soil Conservation Service, Anderson, S. C.



# Change and Conservation Progress in 1959

By D. A. Williams

**T**ODAY the one thing we can be sure of, in conservation as in all other activities, is change—constant, relentless change. The world about us is changing so rapidly that even with instantaneous communications we are taxed to keep abreast of the times.

Scientific progress often renders a product almost obsolete before its mass production process is perfected. The shifting agricultural economy—with larger farms, more mechanization, vertical integration, and greater emphasis on management skills—poses problems to the Soil Conservation Service as well as to other agencies.

Despite the increasing technical complexity of today's living, the appreciation of the role of natural resources is growing. Thinking people in all walks of life are coming to realize that most of the great developments of our time could ultimately be meaningless if we do not maintain our resources base.

Advancing technology in agriculture as in industry requires us constantly to reexamine the role of soil and water conservation in our national life and to see that conservation technology keeps pace with its allied arts. We must interpret soil and water conservation in terms of today's realities—not yesterday's.

This leads us to a broadened concept of conservation. It no longer suffices merely to point with alarm at the specter of soil erosion and water waste. We must show how to use our land resources more efficiently to meet the needs of our growing population—today and on into the future.

Land use choices today cannot be made simply in terms of production potentials and needs. "Space" uses of land compete increasingly with

agricultural production. Extending urban settlements, highways, and other nonfarm uses are covering an estimated million or more acres a year. At the same time people with more leisure and better incomes need more land for parks, forests, lakes, wilderness, and other recreational purposes. Land use patterns, therefore, must be constantly adjusted to supply both material and nonmaterial needs of our people, and the soil and water conservation problems created by these uses must be dealt with.

Improved technology, including that of soil and water conservation, must be depended on to feed and clothe an estimated 230 million people in the United States by 1975, and 370 million by 2010, from approximately the same acreage of agricultural land as is in use today. The Agricultural Research Service recently pointed out that to meet 1975 demands "we must devise improvements 30 percent faster than we did during the fruitful 20 years preceding 1956."

To develop a technology equivalent to the projected need of 400 million acres of additional land by 2010 "will require improvements in farm practices at a rate 160 percent as great as in the past two decades."

Granted that there is no visible limit to the ingenuity of man, we cannot suppose that improved agricultural technology can bear fruit without the land and water to which it can be applied. Those resources, which do have definite limits, must be kept intact for the successful exploitation of man's ingenuity.

This is the setting in which the soil conservation job must be carried forward. The following paragraphs recount some of the Soil Conservation Service activities in fiscal year 1959 to fit into that situation and to keep in step with ever-moving modern technology, thought, and needs.

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Note:—This article is a digest of a report for the fiscal year 1959 submitted to the Secretary of Agriculture by D. A. Williams, Administrator of the Soil Conservation Service.

## Conservation Needs

A look at the soil and water conservation job ahead is contained in results of the National Inventory of Soil and Water Conservation Needs being conducted by 8 agencies of the Department of Agriculture.

This inventory will provide specific information about the land and water resources of every county in the United States and estimates of soil and water conservation needs in terms of the land use, population, and economic conditions expected in 1975. It will include an inventory of watershed project needs.

The Soil Conservation Service is responsible for leadership in making field surveys and assembling and analyzing data, in cooperation with inter-agency committees in every county and State. The work of county committees is scheduled for completion by January 1, 1960. Progress to June 30, 1959, was on schedule in most States. Mapping of soils and land use on representative sample areas was completed in all but a few counties.

### Soil Surveys

Soil surveys give a factual picture of land use capabilities and conservation needs as a scientific basis for planning soil and water conservation for a farm, ranch, watershed, or other land area. They are also used increasingly for nonagricultural purposes such as city and suburban land-use planning and in highway and building construction.

Although agricultural production and other land uses are limited by the natural potentialities of the soil, modern technology makes it possible to modify soils in many ways. In fact, the most efficient agricultural production requires soil and field conditions different from the natural state of most of our land. Soil surveys not only show the natural limitations of each soil but indicate the degree to which desirable changes are feasible with new farming and conservation methods.

**Mapping Progress**—More than 615 million acres have been mapped to date in sufficient detail for conservation planning. This is about half the agricultural land in soil conservation districts and 30 percent of the total land area of the United States.

In fiscal year 1959 field mapping covered about 48,000,000 acres, compared to 41,094,326 in 1958. This is

an increase of 16.9 percent.

A total of 1,538 "standard" soil surveys—i.e., meeting rigid requirements of the National Cooperative Soil Survey—were underway by June 30, about 660 of them on a "progressive" basis.

**Cooperation with Other Agencies**—The SCS expanded its cooperative work with the Bureau of Public Roads to obtain information on the engineering properties of soils. Seven additional State highway department laboratories agreed to do testing work, bringing to 18 the number of States cooperating.

Results of these tests are included in soil survey reports and are used immediately by SCS engineers and others working in soil conservation districts and watershed treatment projects.

Results of this work are also provided to the Federal Housing Administration for use in appraising building sites and designing construction.

An increasing number of areas in the National Forests are being surveyed cooperatively by the Forest Service, SCS, and land-grant colleges. Forest Service soil scientists do most of the field mapping and the Soil Conservation Service correlates the soil classification.

**Soil Classification and Correlation**—Work has continued on revision of the nationwide system of soil classification. Trial groupings of soil series into classes in each of the five higher categories were reviewed and revised and are being tested further. Plans are to have a preliminary publication of the revised system available at the time of the Seventh International Congress of Soil Science to be held in this country in 1960.

Field studies have been made in a number of places to achieve better interstate correlation and greater uniformity in the description and definition of soils. Joint studies of classification problems and series concepts were made with Canadian soil scientists across the borders between Ontario and Michigan and between Quebec, Maine, and New Brunswick.

**Soil Survey Reports**—Thirty-four edited soil survey reports with accompanying map materials were sent to the Government Printing Office during the year. This makes a total of 63 reports in the Government Printing Office awaiting publication. Thirty-seven soil survey reports were published in 1959 as compared to 16 reports in 1958.





Most of the soil survey reports sent to the printer during the year contained engineering sections prepared jointly by engineers and soil scientists.

Improved sections on climate are being prepared for soil survey reports. The Weather Bureau is assisting in making predictions of the probability of frost damage, low rainfall, or other statistics important to the area. This data can be interpreted in terms of crop production, crop selection, soil loss under specified management, or used for other purposes.

Practically all of the soil survey reports now being published contain basic soil interpretations; the soil map is on a photomosaic base. The Service is making an effort to use published soil survey reports in farm and ranch planning and to key the soil maps and interpretive material to technical guides.

**Soil Interpretation**—Basic soil interpretations are needed for use in woodland planning and in assisting woodland owners to select the best conservation practices for different kinds of soil. Emphasis is being placed on coordinating soil-woodland site index data between States. As a result, several States are now developing special reports summarizing soil-woodland interpretations.

**Soil Survey Laboratories**—The work of the laboratories continued to grow during 1959. Complete physical and chemical characterization studies were completed on 4,500 samples from 649 described profiles from 155 counties in about 45 States and Puerto Rico. Between 50 and 60 reports containing field observations, laboratory data, and interpretations were issued or are being assembled. In addition to these characterization projects about 1,000 samples were run as texture checks and for other special purposes.

The laboratories continued to collect and prepare soil, vegetation, and animal samples from the United States and various locations over the rest of the world as part of the study of the distribution of radioactive strontium. A comprehensive report of the results was prepared in May. A new laboratory building was constructed at Beltsville with Atomic Energy Commission funds to house the sample preparation and analytical work done for the worldwide survey of fallout materials.

**Field Studies**—Field studies of soil-geomorphology relations in desert areas were conducted near Las Cruces, New Mexico. Eight major geomorphic surfaces were delineated and bedrock and surficial sediments determined. This study is increasing our understanding of the erosion processes in deserts.

Studies were continued on (1) the cobalt status of soils in several Southeastern States, (2) molybdenum toxicity in Nevada, (3) the micronutrient status of soils of the Northeastern States, (4) criteria for classifying organic soils, (5) soil-vegetation studies to aid in soil mapping and soil interpretation in extensive grassland and woodland areas, and (6) causes of gullies in western Iowa. The study of long-time relationships of crop yields to climate and soil types in the Great Plains was continued.

**World Soil Map**—The World Soil Map group continued its basic soil mapping across several countries. Major emphasis was given to new interpretations of both new

and old mappings. Collection of information on worldwide geography of soils was continued along with some special effort on those elements in soils important in radioactive contamination.

Compilation of a new 1:5,000,000 soil map of the United States was started.

**Cartography**—The cartographic units in 1959 provided an increasing amount of assistance in connection with small watershed protection projects and continued to provide facilitating service for conservation operations.

Soil maps for 43 counties and projects were completed and as of June 30, 1959, the press negatives were ready for the printer. In addition, 141 other counties or projects were in some stage of work in the cartographic units.

The Service produced 361,399 prints of soil and land capability maps for 131,994 farms and ranches and 454,166 prints of conservation plan base maps for 156,902 farms and ranches. In addition, the cartographic units provided 13,702 engineering drawings, 8,046 planimetric maps, topographic maps covering 275,179 acres, aerial photographic mosaics covering 11,539,988 acres, 203,104 aerial photographs, and other miscellaneous planning aids. Much of this work was for watershed projects.



## Plant Technology

Plant technicians saw definite progress in the use of research results in crop production and soil management, in improved methods of grass seeding, and in wider use of new plants for soil and water conservation.

**Cropland Planting**—“Plot planting” and “wheel-track planting” are examples of new methods of producing crops that not only reduce soil and water losses, but also provide better weed control, require fewer tillage operations, and reduce cost of production, all with no decrease in crop yields. These practices have been widely adopted by farmers in parts of the Corn Belt.

**Range Seeding**—New equipment for seeding grass in sandy rangeland covered with sagebrush and weeds was developed for use in several soil conservation districts in southwestern Kansas.

The new planter consists of a toolbar on which two lister-type shovels and individual seed hoppers were mounted 42 inches apart. This equipment reduced competition from sagebrush and weeds enough to permit

the new grass seedlings to become established without increasing the wind erosion hazard. During the past 2 years more than 100,000 acres of depleted sandy rangeland has been successfully seeded with this tool.

Nationwide, the amount of range seeding in soil conservation districts increased 31 percent over the preceding year to reach a total of 1,696,000 acres.

**Water control for woodland management**—During the year SCS engineers, soil scientists, and woodland conservationists worked together to develop guides for the control of surface water in coastal woodlands. About 12 years ago the Service undertook field observations on areas where structures had been built to stabilize water levels or otherwise control surplus surface water as a management practice in wet woodlands. Since then the practice has spread into the lower and upper coastal plains of the southeastern States until it is now being used by many landowners, both large and small. Preliminary conservation needs estimates show that there are approximately 45-50 million acres of woodland on which water-level control is needed.

**Farming for waterfowl**—During the year significant progress in the improvement of private lands for waterfowl in the southeastern States and on the Pacific Coast has given promise of more waterfowl wintering habitat, improved facilities for waterfowl harvest to meet increased demand from hunters, and an economic return to farmers and ranchers.

This is being achieved by "farming for waterfowl," a term used to describe modern farming technologies employed in the development and management of tillable lands for the annual production of a dependable, high-quality food crop for waterfowl, replacing the hit-or-miss methods of the past.

**Coordination of specifications**—Continued progress was made in coordinating specifications across State boundaries where similar soil and agricultural conditions exist. This was done in many places and in various phases of plant technology. It is well exemplified by the results in the Great Plains, where all States now use the same specifications for stubble mulching. Determinations of wind erodibility and wind erosion control methods are also comparable now in the different Plains States.

**Better Plant Materials**—Further testing of several new varieties of grasses and legumes, and extended uses for some old varieties, advanced the use of specialized plant materials for soil and water conservation.

Seed of a vigorous strain of bermudagrass, NK-37, was placed on the market for pasture and hay in the Southeast, and a local strain of native switchgrass, Pangborn, proved superior for use in gullies.

Big trefoil and creeping bentgrass proved valuable for stabilizing ditch banks in the Northeast, and field brome was very effective as a soil cover in steep orchards. Two native panicu-grasses, *P. amarum* and *P. amarulum*, were effective as sand binders for dune stabilization and shore protection.

In the Corn Belt States, the use of field brome was extended as a cover crop in corn and in fruit orchards. Sand lovegrass, a native of the Great Plains, proved useful in stabilizing blow sand in eastern Iowa and western Illinois, and mountain brome was used success-

fully as a cover crop in commercial hybrid corn seed production in Illinois.

In the Great Plains an annual inventory of the need for grass seed enabled producers to plan production and harvesting schedules and helped to assure a more adequate supply of the species needed for critical revegetation work. Marked progress was made in the production of many of the grass seeds that had not been available on the market.

At the National Plant Materials Center at Beltsville, Md., approximately 800 new accessions of plants were received and processed, most of them from foreign lands, and some 1,100 packets of seed were distributed, of which 300 packets went to 30 foreign countries, partly in return for seed obtained from them. The five new plant materials centers authorized year before last are all now in full operation.



## Engineering

**Erosion Control Practices**—The trend toward larger farm equipment and the shortage of farm labor is creating new problems in planning terrace systems. Better terrace alignment received further attention during the past year and "parallel" terrace systems are gaining in favor. Studies were started to determine the relation of required terrace spacings to the use of other recommended practices such as contour cultivation and conservation cropping systems.

**Drainage**—Service engineers worked with manufacturers of drain tile on quality criteria and inspection methods. The American Society for Testing Materials issued specifications for a new class of concrete drain tile known as "special quality" for use in acid and alkali conditions. SCS engineers also assisted ASTM in setting up criteria for a new class of clay drain tile, "heavy duty," for use where external loading exceeds that allowable under existing specifications.

Conservation engineers helped with the evaluation of organic filters surrounding drain tile in western Washington and subsurface and salinity problems in Texas. They set up field trials in New Jersey to record the discharge of tile drains and observe the drawdown of groundwater between drains. In the southeast trials of a new type of narrow, deep field drain gave favorable results.



**Hydrology**—The Service gave major emphasis to improving hydrologic techniques of watershed planning, including consideration of more alternates in structural location and design.

Projects being carried out under a memorandum of agreement with the Weather Bureau are providing improved information on rainfall intensity-frequency regimes and probable maximum precipitation that will provide the basis for improving criteria for the design of class b and c dams.

Activities being carried out under a memorandum of agreement between the Service and the Geological Survey are: (1) A tabulation of peak discharge and storm runoff volumes for 2,445 selected gaging stations; (2) a study of reservoir inflow hydrographs of many pond gage installations operated by the Geological Survey; and (3) a study of flood routing methods.

**Snow Surveys and Water Supply Forecasting**—Cooperative relations with Federal, State, and private agencies were augmented by new cooperative agreements with the University of Arizona covering research to improve forecasting procedures; with the State Engineer of Oregon to support collection of data in Oregon; and an international agreement with the Province of British Columbia to cover the mutual exchange of snow-survey data in watersheds divided by the international border.

Several additional water-supply forecast bulletins for individual soil conservation districts were started. In four states—Oregon, Nevada, Idaho, and Wyoming—practically all soil conservation districts now receive these locally-oriented bulletins.

Installation of radios for over-snow machines continued. In one instance in Idaho when an over-snow machine had a mechanical breakdown the availability of radio equipment resulted in savings amounting to the initial cost of all radio equipment in the State.

The use of automatic electronic computers in processing snow-survey data was started this year in Montana and Colorado. The Agricultural Research Service began a study to improve snow measurements by mechanical and electronic means that may eliminate the need for snow surveyors to visit the snow courses to record data.

**Design and Construction**—Design sections of the Service prepared detailed construction plans and specifications during the year for work estimated to cost about \$25,300,000, an increase of 87 percent over the previous year. Most of this work was for watershed operations. Fourteen State design offices are now in operation, primarily on preliminary design.

A start was made in the use of engineering services contracts to augment the work of Service engineers in planning and operations. To date, a total of approximately \$795,000 has been expended in negotiated engineering contracts.

**Irrigation**—Increased irrigation activity in small watershed projects under PL-566 has required the review of SCS techniques, procedures, and policies to better adapt them to this new phase of Service work. River basin studies requiring estimates on irrigation water requirements of the Delaware, Potomac, and Huron rivers and Upper Colorado River have also presented new prob-

lems requiring the development of different techniques and procedures.

Land leveling and surface irrigation have continued to expand in the eastern United States. A total of 526,528 acres of land leveling was completed during the year. This was a gain of 14 percent over the preceding year.

The control of erosion on irrigated land in the higher rainfall areas of Kansas, Nebraska, and South Dakota by contour bench leveling is progressing satisfactorily.

**Handbook Materials and Standards**—Handbook materials and technical guides on many phases of soil and water conservation engineering were prepared and issued during the year. These materials provide a growing body of uniform instruction for engineering work throughout the United States.

**Interagency Cooperation**—The Service continued to cooperate with the U.S. Geological Survey in collection of basic data on trap-efficiency of floodwater-retarding reservoirs and with other Federal agencies in collection, analysis, and interchange of sedimentation data.

The SCS worked closely with the Corps of Engineers of the Army, especially in the Mississippi Valley, in coordination of design criteria so that farmers would benefit to the fullest extent by the drainage work of the two agencies.

The Agricultural Research Service, Soil Conservation Service, and Bureau of Reclamation continued a coordinated 5-year study of methods for estimating the effects of land use changes and treatment on the yield of water by streams and rivers.

## Soil Conservation Districts

Conservation technology becomes effective on the land mainly through the medium of soil conservation districts and their farmer and rancher cooperators.

Soil conservation districts, as local units of State government, have the job of pulling a wide variety of conservation programs and interests together into one program that effectively attacks local soil and water problems.

Since the primary job of the Soil Conservation Service is to provide technical help to farmers and ranchers through their soil conservation districts, the SCS took several steps to improve working relationships with districts.

One step was a restatement of the Service's longstanding policy toward districts and their business affairs. Another was the publication of a joint Program of Action developed by representatives of soil conservation districts and the SCS. The Program of Action emphasizes the responsibilities of each organization and suggests methods by which districts can make more effective use of technical facilities of SCS.

The SCS also encouraged districts to make use of the Department of Agriculture's conservation loan, cost-sharing, commodity, extension education, and other programs where they could be used to advantage.

The Service in fiscal year 1959 provided technical help to 2,847 of the 2,861 districts in the 50 States, Puerto Rico, and the Virgin Islands. These districts include

about 95 percent of all the farms and ranches and cover more than 90 percent of the farmland of the nation. Seventy-two new districts were organized during the year and 17 were dissolved, giving a net increase of 55 for the year.

Districts added 113,351 new cooperators during the year, but cancellations reduced the gain to a net of 65,028. At the end of the year, 1,859,439 farmers and ranchers operating 563,743,296 acres were cooperating with their districts. About half of these farmers and ranchers received technical help from the Service during the year.

In addition, the SCS provided technical assistance on 2,647 water-management group enterprises, each involving several landowners in a soil conservation district. These group projects dealt with irrigation, drainage, or other water problems affecting 23,087 farms and ranches and benefited 1,847,000 acres.

### Farm and Ranch Planning

Soil conservation district cooperators developed 92,800 new basic conservation plans during the year covering 29,386,204 acres. In addition, 15,572 district cooperators revised plans on 8,613,472 acres to include improvements in conservation methods or adjustment to changes in economic conditions. Altogether, this makes 1,279,634 farms and ranches, embracing 365 million acres, having basic plans.

In assisting district cooperators with conservation planning, the Service emphasized that a basic plan is not a "format" but a concept or idea of sound soil and water management. It is the image, on paper, of the conservation methods which a farmer or rancher decides he wants to use once he has sound technical information and understanding of his land's needs. The plan is not an end in itself, but only the beginning of effective conservation farming or ranching.

**Rurban Planning**—Many soil conservation district governing bodies have adopted a policy of giving limited assistance to landowners who are nonfarmers. This is especially true in the Northeast and on the West Coast where large areas have gone into suburban and industrial developments, often leaving much land in an in-between state of partial use or nonuse that is neither rural nor urban.

The Service in 1959 announced a policy of working with soil conservation districts on "rurban" problems and made arrangements to provide technical information and assistance on request. The assistance consists largely of supplying information about soils and their interpretations, advice as to proper treatment and management of land, and guidance on problems of flooding, drainage, and other types of water management. Such help usually has a lower priority than help to active farmers or ranchers.

### Land Treatment

Plans by themselves neither protect nor improve soil nor conserve water. The landowner's or operator's decisions must first be acted upon and the planned measures applied to the land.

Although a single practice seldom accomplishes much

by itself, the sum of conservation practices applied to the land according to well-laid plans is a good measure of conservation progress. The Soil Conservation Service in fiscal year 1959 gave assistance to 896,382 district cooperators in putting their conservation plans into effect.

The following table summarizes some of the accomplishments in land treatment.

Conservation practices newly applied in soil conservation districts, with SCS assistance, 1959.

|                            |        |           |
|----------------------------|--------|-----------|
| Contour farming            | acres  | 2,070,458 |
| Conservation crop rotation | acres  | 6,495,194 |
| Cover cropping             | acres  | 3,116,221 |
| Stripcropping              | acres  | 727,663   |
| Stubble mulching           | acres  | 3,274,246 |
| Terracing                  | miles  | 46,011    |
| Waterway development       | acres  | 65,573    |
| Pasture planting           | acres  | 3,065,153 |
| Range seeding              | acres  | 1,696,193 |
| Tree planting              | acres  | 1,046,956 |
| Wildlife area improvement  | acres  | 536,815   |
| Drainage improvements      | acres  | 1,756,801 |
| Land leveling              | acres  | 526,528   |
| Improved water application | acres  | 1,165,984 |
| Pond construction          | number | 66,809    |



### Watershed Protection and Flood Prevention

The small watershed is becoming widely recognized as a practical unit for soil and water resource protection, development, and management.

Structural design and installation in watershed projects is of such a scope that individual landowners cannot install the measures with ordinary farm equipment. Recent advances in earth and concrete construction and improvements in equipment for earthmoving and shaping have opened up new possibilities of agricultural watershed protection.

The acre-by-acre and farm-by-farm conservation treatment of land above watershed structures continues to be a fundamental requirement of watershed treatment. As in the past, this land treatment work is accomplished mainly through soil conservation district operations.



**Community Watershed Projects**—The Service worked with State agencies responsible for approving Watershed Protection and Flood Prevention projects under Public Law 566 to develop mutually acceptable principles for establishing priorities of work.

Standards for judging the soundness of watershed projects are being strengthened and more careful investigations of costs and feasibility are being required to assure watershed programs of real public benefit. Care is being exercised to discourage requests for approval of projects that will benefit only a few landowners or that represent an unusually high cost per acre.

Applications for planning assistance under PL 566 were received from 261 watersheds during the year. At the end of the year, 47 States and one territory had submitted a total of 1,148 applications for Federal assistance in planning.

During the year, 82 applications were approved for work plan development. This brought the total watersheds approved for planning to 446 in 47 States and one territory. At the end of the year, planning had been suspended or terminated in 67 watersheds. These suspensions or terminations were at the request of the local organizations or with their concurrence.

The Forest Service, Bureau of Land Management, and Bureau of Indian Affairs assisted with watershed planning where problems required such assistance.

In eight States, additional planning assistance amounting to more than \$600,000 was provided through trust fund agreements, reimbursements, State-controlled planning parties, or personnel provided by the States.

Public Law 566 was further amended by the 85th Congress to provide for recognition of the conservation and development of wildlife resources in watershed projects and to authorize the Secretary of Agriculture to provide cost-sharing assistance to local organizations for fish and wildlife development as a part of projects. Policies and procedures for carrying out the provisions of these amendments were formulated and placed in effect.

Installation of works of improvement was given in two stages: (1) "Approval for advanced engineering and other technical assistance," and (2) "Approval for construction of structural measures." The first stage authorizes the use of Federal funds to make surveys, prepare designs and specifications, and for technical assistance to plan and apply land treatment measures. Approval for the second stage provides Federal funds to negotiate a project agreement for construction work.

During the year, 80 projects were "Approved for advanced engineering and other technical assistance" and 60 projects were "Approved for construction of structural measures." This brought the total projects approved for Federal assistance in the installation of works of improvement to 180. Of those, 107 are "Approved for the construction of structural measures."

**Watershed Protection (Pilot)**—There were 39 active pilot watershed projects this year.

Eight projects were completed during the year except for project evaluations and completion reports.

It is estimated that a total of 30 projects had all structural measures completed and seven additional projects had the planned structural measures more than 90 percent completed at the close of the fiscal year. **Flood Prevention**—Work plans were prepared for 12 subwatersheds and 8 subwatershed areas in the 11 watersheds authorized for flood prevention work. This makes a total of 179 subwatershed work plans and 16 subwatershed area work plans completed to date. Structural work and land treatment continued at a satisfactory rate in these subwatersheds.



**Assistance to the States**—During the year specialized technical assistance was provided on request to State agencies in Mississippi, Tennessee, Kentucky, and Maryland in developing reports on water problems and plans and procedures for studies of water problems and water rights. Summaries were prepared of the progress in water policy and program legislation in Alabama, Arkansas, Florida, Georgia, Mississippi, Tennessee, and North Carolina.

Field studies were made of a number of watershed protection projects with respect to water rights problems in Louisiana and Colorado.

**River Basin Investigations**—The Service joined with other agencies of the Department in improving procedures for coordinating studies and exchanging information between the many agencies, both Federal and State, interested in water problems of large river basins.

The Inter-Agency Committee on Water Resources issued a policy statement on the subject, and the SCS followed up by developing procedures for distributing information and coordinating review within the Department of Agriculture of survey reports from agencies outside the Department.

Investigations were underway during the year in the following river basins: Delaware, Potomac, Lower Mississippi Tributaries, Yazoo-Mississippi, Kansas, Colorado River Storage Project, Haw, Upper Mississippi and Great Lakes, and Huron. Comments were developed for the Department on 12 proposed reports of the Corps of Engineers, 3 of the Bureau of Reclamation, and 1 of the Department of State.

## Great Plains Conservation Program

Farmers and ranchers entered into 2,316 contracts under the Great Plains Conservation Program in the fiscal year. These contracts cover 5,955,000 acres on which the operators agreed on basic conservation plans aimed at stabilizing agriculture through better land use and conservation measures with the aid of long-term cost sharing. Cumulative totals as of June 30, 1959, were 2,886 contracts covering about 7.8 million acres.

On June 30, 1959, 340 countries in 10 States were authorized to participate in the program. Demands for help exceeded the \$10 million annual appropriation available.

During the year a total of 4,243 applications were received for assistance on 13.8 million acres. At the end of the year a workload of nearly 3,000 applications covering about 11 million acres was on hand.

Planned conversions of cropland to other uses, mainly range, during the year totaled 190,000 acres, or 27.8 percent of the total cropland acres at the time contracts were prepared. Nearly 119,000 acres of this total were planned for cost sharing under the Great Plains Conservation Program and more than 71,000 acres for cost sharing under other programs. The planned cropland conversions since the beginning of field operations in December 1957 totaled about 263,000 acres, or 29.5 percent of the total cropland at the time plans were prepared.

In many areas the success of the Great Plains Conservation Program depends largely on the extent and success of range reseeding. A total of about 235,000 acres of range reseeding was planned during the year, bringing the total planned to date to 361,000 acres.

## Other Programs

The Service gave direct assistance to Rural Development Program activities in 67 counties to which special funds were allotted. This aid amounted to a total of approximately 90 man-years, principally for soil survey and conservation farm planning technicians. They gave an average of 1½ man-years' service to Rural Development Program areas (some of more than one county) in 29 states and Puerto Rico. This assistance was in addition to regular Service technical help to soil conservation districts which also include Rural Development Program land owners or operators.

The Service continued to assist Agricultural Conservation Program participants with permanent-type practices on which cost sharing was requested. Such assistance was provided on about 361,000 farms and ranches.

The Service provided technical assistance to about 9,300 participants in the Conservation Reserve Program of the Soil Bank. This included general counseling as well as direct assistance in selecting lands for contract and installing treatments for long-time protection.

Assistance to the Farmers Home Administration in its conservation and watershed loan programs continued.

# An Editor becomes a Conservationist

By Ovid Neal

**H**ERB KARNER—Farm Editor for the *Tulsa World*—is a man who writes good, "down-to-earth" stories about the land and the people who live on it. These stories are rich and full because the writer has lived through many experiences akin to those of the farmers about whom he writes.

Eight years ago the Karners bought an 80-acre farm in Wagoner County, Okla. When the Karners moved onto it, the farm was "not a pretty sight." It consisted of 40 acres of worn-out, badly eroded cultivated land, 25 acres of unmanaged woodland and wasteland, 5 acres of native meadow, and 10 acres of almost worthless pastureland. The cultivated land was cut by numerous gullies that were too big and deep to cross with farm equipment. The pasture was made up mostly of weeds and did not furnish more than enough grazing for one cow. Two large drains crossed the farm. The areas covered by these drains were wasteland.

In 1952, Herb became a cooperator with the Wagoner County Soil Conservation District.

Note:—The author is a former Soil Conservation Service engineer, now retired.



Herb Karner and son with solar laying house in background.





Diversion terrace covered with bermudagrass on the Karner farm.

Technicians of the Soil Conservation Service furnished technical information and assistance in working out a soil and moisture program adapted to Herb's farm. It wasn't too difficult to work out a plan with Herb. He had his conservation route pretty well mapped: laying hens and pasture development. All that would be required to do the job was a lot of work on the part of the farm team, which consisted of Herb, Mrs. Karner, two boys—Gary 15 and Kenneth 5, and one girl—Valarie, age 12.

In 1953 when the team took the field things began to happen. Diversion terraces were surveyed and built, a farm pond was staked and built, gully treatment was begun, Bermuda sod

The fish-stocked pond on the Karner farm.



was planted in the gullies, Bermuda sprigging was done on the pastureland, and a waterway was laid out and built. The waterway has made it possible to complete reclamation of former wasteland. This area is now tied down with excellent bermudagrass pasture.

The Karners started out with 340 laying hens. They have expanded their poultry business to their present flock of 5,200 layers. Is the poultry business profitable? Karner will tell you, "Yes! But speaking of profit, what about that 10 tons of chicken manure that I haul out every month?"

The bermudagrass pasture has the answer for this. Luxuriant native and Midland bermudagrass grows knee high in many areas. This bermudagrass is mixed with Ladino clover, big and little hopclover, sweetclover, Korean lespedeza, and vetch. Now 14 beef cattle, two dairy cows, a heifer, and a horse enjoy this good pasture. Every acre on the farm is serving a useful purpose. The farm pond is stocked with fish. There is plenty of fish in the deep freeze and fish for the neighbors besides.

The woodland near the main draw and native meadow gives protective shelter to the livestock during the winter months. It constitutes an excellent wildlife habitat, harboring rabbit, squirrel, quail, and songbirds.

The gully-treatment work is almost completed; and, with the exception of a small area, the scars of erosion are completely healed with a cover of useful pasture plants.

From what I have seen and from what Herb has told me, I know that this conservation venture has been fun; but, interspersed with the fun, there was much vision, great perserverance, and a lot of hard work.

### *SCS helps locate a new highway*

The New Jersey Highway Department recently asked the SCS State office to help locate a new highway so that the least damage would be done in taking good farmland out of production and dividing farms into parcels that would be uneconomical to operate.



It usually isn't the amount of rain that causes erosion, it is how fast it falls,

## DISTRICT PROFILE

ISAAC THOMAS  
of  
DELAWARE

**A**ROUND his home town of Marydel, Isaac Thomas is known as "Ike." Over his native state of Delaware he's often called "Mr. Conservation." He acquired the latter name for his pioneering work in soil and water conservation, both on his farm in Kent County and in the State capital at Dover.

Ike grew up with the conviction that conservation farming pays handsome dividends in the long run. With this belief and no more agricultural training than a high school Vo-Ag course, he became a leading farmer in his State.

Ike Thomas started farming on his own with a 140-acre piece of land his father gave him. Today he operates 500 acres of tillable land plus more than 400 acres of good timberland. His 926-acre farm, covered by four conservation farm plans, is considered one of the finest dairy operations in Delaware.

Thinking back to the earlier days, Ike said: "Some of this land was knee-deep in water every spring. We couldn't work the land until mid-summer. After we added the drainage system, the land was dry enough to give us time to get three cuttings of hay."

During a summer dry spell several years ago, before pasture irrigation became popular, Ike devised a makeshift irrigation setup by using an old pump, some garden hose, and water from a tax ditch. He saved a good pasture seeding from being burned out by the drought. Now he has an up-to-date system that he holds in reserve for dry periods.

Ike put his woodlot to good use a few times during the 1940's. A new house, built for his growing family, was made of timber from the farm. A few years later he built a modern barn, also made of timber from the Thomas farms.

The new house and barn needed fire protection. There was a wet spot behind the house, not too far from the barn. It was partly drained by an old tile line but still was too wet

for grazing. SCS-designed farm ponds were something relatively new at the time, but Ike wanted to try the idea. So SCS technicians designed a 1/4-acre pond and used the tile line for an outlet.

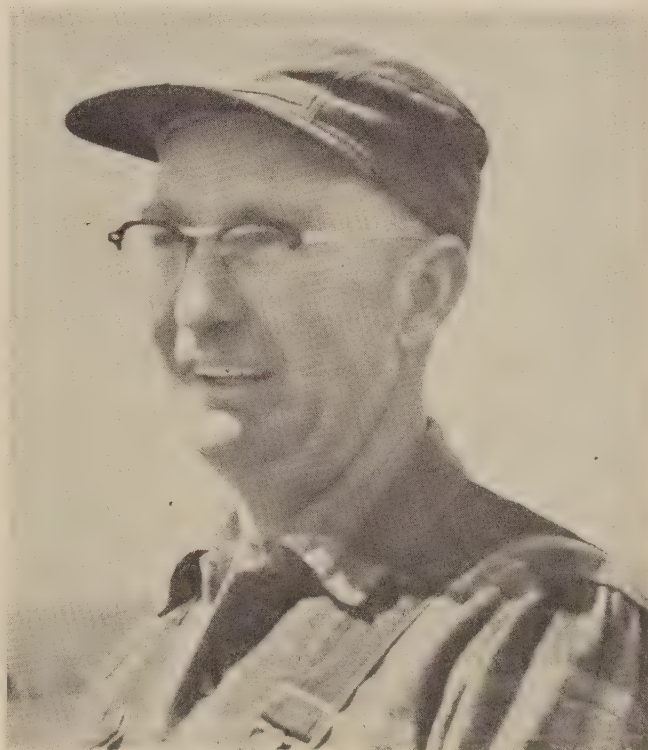
A good rotation, plenty of fertilizer, and seedings of improved grasses and legumes have made Ike's hay production one of the highest in the State. He sells more than 4,000 bales of extra hay each year. His herd of 65 mixed milkers has one of the highest production records in the area.

The conservation farm plan includes a good wildlife angle, too. Lespedeza is planted along all new ditch banks and in odd areas. Ike notes: "The lespedeza makes good food and cover for small game and it does a good job of holding the new ditch banks."

Ike added a 200-acre abandoned farm to his operations three years ago. In less than three years he cleared away scrub trees and an old orchard, installed a new drainage system, then cover cropped and fertilized for two years to build up the soil. Now he has a beautiful stand of orchardgrass and red and Ladino clover on it.

In 1941 Thomas served a term as representative in the General Assembly of Delaware. There he worked for the passage of the enabling

Isaac Thomas





CHANGE OF ADDRESS SHOULD INCLUDE ZONE, OLD ADDRESS, AND CODE NUMBER

legislation for creation of soil conservation districts in Delaware.

When landowners created the Kent County Soil Conservation District in 1943, Ike was elected a member of the board of supervisors. At the first meeting of the district organization, he was made president. Subsequently, he was elected district treasurer, a position he still holds.

In 1955 Ike was elected vice president of the Delaware State Association of Soil Conservation District Supervisors and served two terms. He was elected president of the State association at the 1957 meeting and served two terms in that office. Ike's latest SCD assignment is council representative for Delaware in the National Association of Soil Conservation Districts.

In 1954 the Governor appointed Ike an agricultural member of the Delaware Water Resources Study Committee. Last fall he was appointed a member of the State ASC Committee for a three-year term.

In addition to his official conservation duties, Ike is a member of the Grange, Lions Club, Farm Bureau, and Eastern States Farmers' Exchange. He has been a community 4-H club leader for years.

—GORDON S. SMITH

### ***Coastal Bermuda Corn Rotation***

A new way to manage a rotation of Coastal bermudagrass and corn so that the grass will reestablish itself after the corn crop has been developed by the Georgia Experiment Station and the Agricultural Research Service. The 4-year rotation includes 3 years of Coastal bermuda and 1 year of corn and should be

highly effective in controlling erosion on erodible lands.

Once the bermudagrass is well established on a field, the stand is not entirely destroyed by tilling for the following corn crop. After the corn is planted, the grass begins to recover and forms a good sod before the corn is harvested. This means that the surface of the soil is unprotected for only about 3 months during the 4-year rotation, and a good hay crop can be cut during the first year after the corn is harvested.



The Soil Conservation Service had 14,608 full-time employees at the end of the fiscal year 1959, compared to 14,478 a year before. In the Washington area there were 432 employees, compared to 474 a year before.





**MARCH 1960**



# **SOIL CONSERVATION**

Soil Conservation Service • U. S. Department of Agriculture



# SOIL CONSERVATION

**EZRA TAFT BENSON**  
SECRETARY OF AGRICULTURE

**DONALD A. WILLIAMS**  
ADMINISTRATOR, SOIL CONSERVATION SERVICE

OFFICIAL ORGAN OF THE SOIL CONSERVATION SERVICE  
U. S. DEPARTMENT OF AGRICULTURE, WASHINGTON, D. C.

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TOM DALE, Editor

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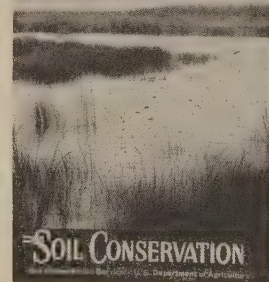
**SCIENTIFIC LAND USE HELPS PRESERVE AND CREATE WILDLIFE HABITAT.**—“Agriculture is not necessarily inimical to wildlife. It is true that agriculture does displace some wildlife by altering its habitat. At the same time, agriculture creates new habitats—for the same kinds of wildlife at other locations, or for other kinds of wildlife whose requirements are better served by an agricultural landscape. As a result, there is probably more wildlife today than when our forefathers first saw this land.

“A land-use pattern that respects the natural capabilities of the land, of a necessity includes a place for wildlife. Some land, uniquely suited to wildlife, is permanently dedicated to that use. The farm or ranch, planned and managed as a whole, produces wildlife as a primary crop of such areas, and as a by-product of the entire land unit.

“Thus it is that modern conservation planning preserves countless acres of wetlands that would have been drained under the less scientific programs of 30 years ago. And the new water areas created by thousands of farm ponds and by hundreds of larger impoundments in watershed projects replace—in part at least—the wet areas that must yield to agricultural use. This is but one example of the way in which soil and water conservation preserves and creates wildlife habitat.”

—D. A. WILLIAMS

MARCH 1960



**FRONT COVER.**—Dugout and dam on an SCD cooperator's farm in Miner county, South Dakota, that provide stockwater and a nesting place for waterfowl.

All orders go to the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

Cooperative efforts create—

# A New Waterfowl Refuge

By Peter W. Taylor

THE Market Lake area near Roberts in southeastern Idaho promises to be one of the best waterfowl refuges in the West, due largely to the determined efforts of one sportsman and the cooperation he obtained from his neighbors and local, State, and Federal agencies.

Back in 1954, Ira Gabrielson, President of the Wildlife Management Institute, was touring the Market Lake area with Eddie Pederson, chairman of the Bonneville County Sportsmen's Association.

"Market Lake is one of the best potential waterfowl refuges left in the West," commented Gabrielson. "If this area is allowed to fall into private ownership, public hunting in Idaho will receive a severe setback."

From that day on, Pederson pursued a campaign to have the Market Lake area purchased by the Idaho Fish and Game Department as a waterfowl refuge. And his campaign has been successful.

"The job of convincing the biologists was

easy," Pederson recalls. "Convincing the local people and the State land board was something else."

The local people were organizing to stop the State purchase because they thought this would cause serious duck depredations, more trouble with hunters, loss of valuable grazing land, and would increase the already-serious drainage problems.

It was generally agreed that the solution to the problem was to work through the West Side Soil Conservation District. After much discussion the West Side district supervisors decided to call a meeting. All local people were invited and a number of outside people interested in the area were welcomed.

The night of the meeting the Roberts Grange Hall was packed. Kenneth Anderson, chairman of the local Rod and Gun Club, acted as moderator. Representatives of the State Fish and Game Department explained their plans for development. The local leaders then were given a chance for rebuttal. Arguments were strong and bitter. In addition, it was brought

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Note:—The author is area conservationist, Soil Conservation Service, Idaho Falls, Ida.



Waterfowl on the Market Lake refuge near Roberts, Idaho.



out that a Salt Lake City group wished to purchase the area to develop it privately. Some felt that under private management there would be less depredation. The situation was deadlocked.

It was at this stage that Anderson called upon a representative of the Soil Conservation Service to explain why this land was best suited for use as a waterfowl refuge and tell the things that might be done to resolve the problems of depredation and drainage.

An explanation of land capabilities was given, showing that much of the area was Class VIII land because of marsh; further, that almost all the rest was Class V or VII and, with proper management, could continue to be used for grazing by lease from the State.

Then the State Fish and Game Department agreed to enter into an agreement with the West Side district for planning, development, and control of the area. Thus, SCS technicians would assist the game department in preparing a complete plan for development of the farmable areas of the proposed refuge, and provide soils information on all areas to be flooded. It was agreed that areas were not to be flooded if soils were highly permeable at the surface or if the floodwater backed up on any sand dunes.

It was agreed that a series of water table stations would be established on adjacent private lands. These would be read at monthly intervals to determine if the flooding was causing an increase in the surrounding drainage problems. If the water table was rising, then the State Fish and Game Department would assist the local people in a water control program that would alleviate this situation. It was further agreed that, insofar as feasible, all drainage water would be pumped into the Butte Market Lake Canal system and made available for irrigation purposes.

With these assurances, sentiment changed; and when a vote was taken only a few were in opposition. The news was relayed back through State land board channels and the new refuge became a fact.

Immediately after the purchase of the Market Lake refuge a cooperative agreement between the West Side Soil Conservation District and the Idaho State Fish and Game Department was signed. Following this SCS technicians and the Fish and Game Department people started

a development plan.

The first job was making a detailed soil survey of the entire refuge. This completed, a topographic survey of all farmable land was made to permit design of the irrigation system, field layout, and land leveling. A detailed engineering survey was made of the old roadside drainage and irrigation supply ditch to facilitate obtaining sufficient water for irrigation. Piezometer sites were selected and holes bored for subsurface water readings in the surrounding area.

A crop rotation system was planned and established on the farm areas. Controlled grazing was planned for suitable areas. Insufficient funds have made it impossible for the Fish and Game Department to establish the system of water-impounding areas, but these are set up for future establishment.

The old irrigation system now has been completely revised and most of the farmland leveled for good irrigation. Cereal grains, peas, and other legumes are being produced for wildlife food. The main water supply system has been revamped to supply needed irrigation water and surveys for additional water supply ditches have been completed.

A drive through the area in the early spring, when thousands of pintail, mallard, geese, and swan stop here on their way north, gives concrete evidence of the soundness of the refuge. Another trip in the fall when hundreds of scatergunners are enjoying the open shooting of both ducks and pheasants gives conclusive proof that the future of the area is good and can get better with further development.



A conservation farm or ranch plan is not merely a format. It is the image on paper of the farmer's or rancher's idea of soil and water management that he wants to use, once he has sound technical information and understanding of his land's needs.



Being up in the air as flight engineer for a commercial airline enabled Harry Proctor, Jr., to see the land and its condition. So he got down to earth in developing a conservation plan for his 250-acre farm near Kansas City, Mo. in cooperation with the Clay County Soil Conservation District.

# The Prairie Chicken Booms Again

By W. H. Lathrop

**T**HE boom-boom-b-o-o-m of the prairie chicken, once nearly extinct in Illinois, is rolling out again over the meadows, grassed waterways, and contoured fields in Marion County."

That's from a story by Bob Basinger, SCS soil conservationist for the Marion Soil Conservation District. It might sound a bit rhetorical except for the farmers' names and locations Bob tells about—and except for the clear photo of a prairie chicken on its nest that headed the front-page story in the *Salem Times Commoner*.

It's the kind of photo that most of us just dream about. It could be obtained only by a man who fails to recognize that certain things are supposed to be impossible.

Both the farmer and his hired man appreciate wildlife and keep a sharp lookout when plowing or mowing to avoid destroying nests, Bob's story relates. The farmer had noticed the prairie chicken flying up and had marked the location of the nest with a stake.

Bob felt fortunate to get within five feet where he could see the hen's eyes and beak down in the thick grass. Here he took what photo-

Note:—The author is information specialist, Soil Conservation Service, Milwaukee, Wis.



Prairie chicken on nest.

graphers call a "safety picture."

Then he inched forward, avoiding any sudden motion. Finally the hen was pecking at his fingers as he parted the thick grass and snapped a photo with the camera about 20 inches from the chicken.

## Tickclover— for Quail and Livestock

By Karl E. Graetz

**A**LL of the tickclovers, sometimes called "beggarweeds" or "beggarticks," are recognized as choice foods for bobwhites. In the colonial period, land clearing and burning were judged to be responsible, in part, for an increase of beggarweeds and other leguminous

Note:—The author is plant materials specialist, Soil Conservation Service, Raleigh, N. C.

weeds. This contributed to a significantly larger quail population than has been present since that time. Early recent efforts at using tickclovers for wildlife consisted primarily in trying to manage existing stands through the use of fire.

As early as 1937, Soil Conservation Service nurseries began the evaluation of tickclovers.



These attempts dealt with many of the species, but they were not carried to conclusion because of the appearance of *Lespedeza bicolor*, which was at that time easier to manage. After *Lespedeza bicolor* had become established as a manageable quail food plant, other plants were sought to complement its use. Service technicians again turned to the tickclovers as the most probable group.

In 1947 a strain of *Desmodium perplexum* (formerly called *D. Dillenii*) was picked up near Clanton, Ala., and tested. Its leafy quality and good seeding habits showed promise for wildlife as well as forage use. This material was increased at the Thorsby, Ala., nursery in 1950-51 and distributed to other nurseries in the southeast. In 1953, initial evaluations of this plant at an SCS nursery confirmed its potential value. From 1954 through 1957 observations were continued that proved the superior qualities of the plant.

The first sizable increase block was planted in the spring of 1957. It has recently been named the Clanton strain. The first field plantings were established in 1958. This is the first

known instance of using this species as a domestic plant.

In general terms, this plant is a perennial, upright, native legume. Specifically, the Clanton strain of tickclover is more leafy, taller, and matures later than other native selections being studied. In 1958, a seed crop was successfully combined near Chapel Hill, N.C., on November 18. It was found that harvesting must wait until the seeds are hard and the pods and stems brown and dry.

An encouraging aspect of this strain is that it probably has a double use. Not only is the seed taken readily by quail, but the plants make good hay if mowed when 16 to 20 inches high. Thus, for example, a farmer could mow part of his field for hay and leave unmowed strips along field borders for quail food. It is even possible to mow the tickclover once in May and still produce an abundant seed crop in the fall.

For forage production, the plant is adapted to most of the southeast with the possible exception of peninsular Florida. Because of late seed maturity, it may not be useful for quail food in the Appalachian Mountains or in other



A field of the Clanton strain of tickclover with bicolor lespedeza around the border.



areas which normally expect frost in late September or early October.

The plant requires moderately well-drained soils with average fertility. It does not do well on highly eroded or deep sand soils, although it can be grown on such sites with adequate fertilization.

In nature, the tickclovers are widely scattered. Except for the annual Florida beggarweed, *Desmodium tortuosum*, they rarely occur in large colonies or pure stands. There has been some doubt that the native tickclovers could be "tamed" or successfully managed as cultivated crops. The Clanton strain seems to have broken through this barrier. Field plantings of this selection show that complete stands can be easily established and managed as a perennial quail food, and that large quantities of seed can be produced on limited areas.

In 1958 successful plantings were established in Johnston, Cleveland, Wake, and Orange Counties, North Carolina. All were planted in 3-foot rows. Hunters found quail in these plantings with frequent regularity. The craws of the quail taken were crammed with tickclover seed. Quail began to use these food blocks early in the fall, and heavy use continued through the winter. Thus, this plant may become an important addition to the shrub lespedezas, such as *Lespedeza bicolor* and *Lespedeza japonica*, which seem to get heaviest use later in the winter.

Seed yield measurements were taken last fall in the Johnston County planting, which was then two years old. The planting is on Norfolk sandy loam. No fertilizer was applied the second year. The plants were uniform in height to about 40 inches, and they formed a complete canopy. A square measuring 10' by 10' was carefully harvested. It yielded 1.57 lbs., or about 684 lbs. per acre.

Plantings are easily established from seed. The plant withstands weed competition well. Row plantings which are fertilized and cultivated at least once are best. Broadcast plantings often take an extra year to become established. Usually they must be clipped high one time to set back tall-growing weeds. Ragweed seems to be the worst competitor.

The tickclovers are occasionally mentioned in the literature as possible subjects for forage investigations. Some species of tickclover have

had limited use for forage production in other countries. They have not received serious attention of agronomists in this country. In 1956 the author noted a native perennial species as an invader in some of the mountain meadows in North Carolina. The farmers were mowing it as an incidental in their production of orchardgrass and fescue hay. It contributed sizable quantities of palatable hay in second and third cuttings. The significance of this fact was generally being overlooked by the farmers.

The possibility of planting tickclover "on purpose" instead of using it "by accident" encouraged us to establish the first field planting for hay or silage in Cherokee County, N. C., in the spring of 1959. The Clanton strain was used, since seed of it had just become available. The cooperator, W. D. McCombs, took a first cutting of hay on July 15th. This turned out 47 bales of hay per acre, which weighed an estimated 3,500 lbs. A second cutting on September 1st, after a long dry period, yielded 22 bales per acre. Mr. McCombs was pleased with the quality of the hay. His cattle found it palatable. This first year performance of seedling plants was creditable. We should expect it to do even better in following years.

Two samples of Clanton tickclover hay were analyzed at North Carolina State College and found to contain about 18 percent protein, 6 percent ash, 3 percent fat, and 42 percent nitrogen-free extract, with only 23 percent fiber. This analysis indicates a high nutritive value, comparable to alfalfa. Its soil and site requirements are less restrictive than for alfalfa. It can be grown in the deep south and the Coastal Plain areas where alfalfa is not entirely at home.

A research project on this plant has been set up with the North Carolina Experiment Station. Plot plantings have been designed to give information on broadcast versus row plantings, effect of 0, 1, 2, and 3 cuttings a year, yields, and other incidental evaluations.

Seed of the Clanton strain of tickclover is not available on the commercial market. Limited quantities are available through the Plant Materials Centers of the Soil Conservation Service.

There is still much to learn about this plant. Our work so far indicates that it has a good chance of becoming a new and useful crop for the Southeast.



More and better food crops bring

# More Geese and Ducks

to their winter refuge.

By J. B. Earle

**M**ORE than 8,000 wild geese are now wintering on the Santee Wildlife Refuge near Summerton, S. C., where only 50 geese were found 7 years ago. Also, an estimated 35,000 ducks visit this refuge each year, whereas only a few thousand could be counted a few years ago. The phenomenal increases in the number of waterfowl are due mainly to the systematic increase in the food supply that was brought about by the refuge managers.

The waterfowl food crops are grown according to a definite plan that was worked out by the refuge managers and SCS technicians. The cropping plan is designed not only to increase the food supply for geese and ducks, but also to conserve and rebuild the productivity of the soil.

Wind erosion has always been a problem on the light sandy soils of the refuge, where there are large open spaces of land and water and strong winds during the winter and spring. Since the wild geese won't feed near hedgerows, the hedges that formerly helped protect the land against the force of winds were removed.

Note:—The author is assistant State conservationist, Soil Conservation Service, Columbia, S. C.

This increased the wind erosion hazards.

Field-stripping for wind erosion control was tried, but was discontinued because more intensive use of the land, double-cropping, was necessary to provide enough food for the increasing number of geese. Mulch farming has been instituted instead, and seems to provide a satisfactory solution for the wind erosion problem.

Small grains, corn, soybeans, and crotalaria are the principal crops grown on the refuge. Small grain, mainly wheat, is planted on the 250 acres of open land each fall. It is used primarily for grazing by geese during the winter. After the geese leave in the early spring, a large part of the area is planted to corn or crotalaria. The corn and crotalaria are planted, separately, in the growing grain without any seedbed preparation. The growing grain gives adequate ground cover against wind erosion until the main blowing season has passed; then it is gradually worked into the soil during the process of cultivation. Since the geese will not eat the corn unless the stalks are chopped down, this is done each fall with a rotary mower.

A part of the small grain is allowed to



Stripcropping with small grain and cultivated crops formerly was used to control wind erosion on the Santee wildlife refuge.



Planting soybeans in small grain stubble on the Santee wildlife refuge.



Corn that was planted in growing wheat on the Santee wildlife refuge.

mature, and produces seed for planting the next year's crop. After this grain is combined, soybeans are planted in the stubble, without prior seedbed preparation. Only a small part of the soybeans are harvested in the fall—just enough to provide seed for the next year's plantings. The remainder is left for geese and duck food.

The corn produces well under this system of management, except during extremely dry years. Refuge manager Gerald F. Baker and his assistant, William A. Reid, are working with SCS technicians in designing a sprinkler system for supplemental irrigation. The water supply is plentiful, of course, on this refuge.

Over the years, the cropping system and residue management practices have helped build

up the organic matter and fertility of the soil. Yields of both corn and small grains are increasing and wind erosion had ceased to be a serious problem.

Managers of this refuge have cooperated with the Clarendon Soil Conservation District for many years. They are not only doing a good job of wildlife conservation but they are also making wise use of soil and water. Their main objective is to provide for migratory waterfowl, especially geese. But they don't stop there. They are well-rounded conservationists.

No hunting is permitted on the refuge. Sightseeing is by request. This is an interesting sight in the late fall when thousands of geese and ducks return again to their wonderful winter home.

## Wildlife Sanctuary in a Suburban Development

By Lester Fox

**B**OTH wildlife and the public benefit from an Audubon sanctuary under development in a once-rural part of Connecticut that has given way to suburban homes, super markets, and turnpikes.

Note:—The author is information specialist, Soil Conservation Service, Upper Darby, Pa.



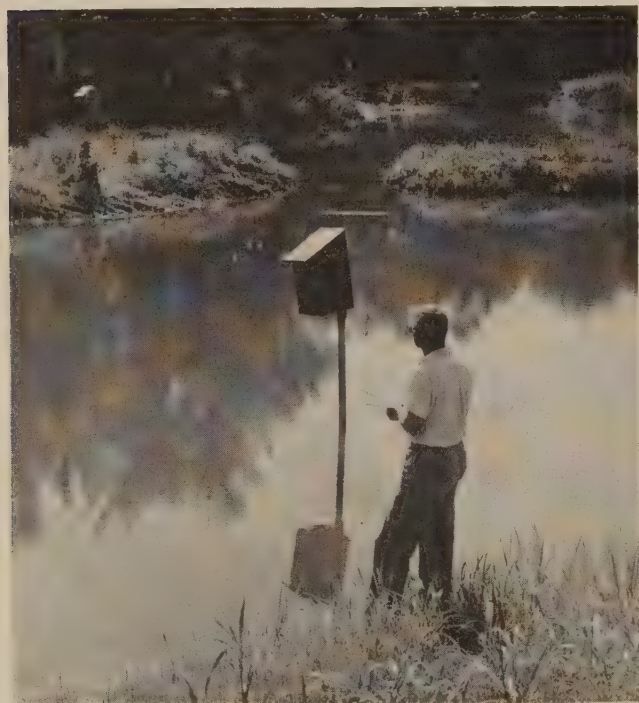
Drilling crotalaria in growing wheat on the Santee wildlife refuge.





SCS technician checks a pond outlet that permits the raising or lowering of water level.

The new sanctuary, curiously enough, resulted from the rapid changes that are annually converting a million acres of our best farmland to other uses. The Audubon Society of Connecticut had a wildlife refuge near Westport. The Connecticut Turnpike swallowed it. The Society, of course, was paid for its land. But it ended



One of the ponds on the Audubon Society wildlife sanctuary near Greenfield Hill, Conn.

up with a handful of cash and no sanctuary.

Mr. and Mrs. Roy E. Larsen gave 40 acres of their land near Greenfield Hill to the Society for a new refuge. The Larsens' aim was to preserve a wildlife area for public benefit in a region rapidly becoming population-saturated.

The Society entered into an agreement with the Fairfield County Soil Conservation District to apply all the conservation measures that the land needed as a wildlife sanctuary. SCS technicians helped work out a conservation plan with Society President J. Reid Williamson of Fairfield. Work started on the land in May 1959. Philip Barske, an executive committee member and a Wildlife Management Institute employee, supervised the work.

Workers cut random trails through the sanctuary. They burned some of the removed brush and piled the rest on the ground as cover for birds, rabbits, and other animals. They opened parts of the natural wooded areas to stimulate grass and shrub growth, thus providing the mixture of cover types important to wildlife.

Parts of the sanctuary are planted to millet, sorghum, buckwheat, sudangrass, and other vegetation that supplies food and cover for wildlife. The conservation plan also calls for planting honeysuckle, multiflora rose, and hemlock, spruce, and pine trees.

Using SCS specifications, the Society built two ponds and developed a swamp and a marsh. The ponds contain flashboards in an outlet so that the water level can be raised or lowered. The water is kept shallow during the summer. That lets the planted Japanese millet, smartweed, switchgrass, and other food plants grow. In September, pond depth is raised to three feet. The water is kept at that level for the benefit of aquatic birds until the following June, when it is lowered again. Nesting boxes at the ponds invite wood ducks.

Mallard ducks are among the wildlife already using the sanctuary. While the refuge was far from complete, they raised two broods in one pond area. Muskrats also are present in considerable numbers. Songbirds are abundant throughout the sanctuary.



About 28 million acres of former cropland will be held out of production in 1960 under the conservation reserve program of the Soil Bank.



# Wildlife Conservation in South Carolina Schools

By J. B. Earle

**W**ILDLIFE conservation is gaining more and more attention in science fairs and in units of instruction in South Carolina schools. These children are learning that one of the best routes to more wildlife is through soil and water conservation. They are learning that wildlife grown on farms and ranches provide most of our hunting, and that much of our fishing is also affected by the way farmers and ranchers manage their land. So, they are beginning to appreciate the fact that farmers and ranchers are the key to abundant wildlife.

They are finding out that the Soil Conservation Service, as part of its assistance to soil conservation districts and watershed projects, helps individual land operators apply many soil and water conservation practices that increase wildlife.

Note:—The author is assistant State conservationist, Soil Conservation Service, Columbia, S. C.

For example, farmers cooperating with the 45 soil conservation districts in South Carolina have built more than 20,000 ponds. Agricultural Conservation Program cost-sharing helped with many of these. Fish for many of the ponds were provided by the U. S. Fish and Wildlife Service.

Also, SCS has helped farmers in South Carolina with more than 30,000 acres of marsh improvement for wildlife. And bicolor lespedeza for quail food has been planted on thousands of acres. Most of these plants were provided by the South Carolina Wildlife Resources Department.

There is much for school children to learn about wildlife conservation because there is considerable activity in this field. Once they come to fully appreciate that wildlife is a crop of the land they will have laid a good foundation on which to develop sound attitudes about conservation of wildlife.

By learning about our resources and the care we must give them, our young people will see that a good share of the world's troubles stem directly from our past failures to learn to live with the land, instead of against it.



Wildlife conservation display in the sixth grade classroom at the Brennan School, Columbia, S. C.



# Wildlife In Eden Valley

By Louis M. Moos

**I**MPROVED irrigation and the use of other soil and water conservation measures on the farmlands of Eden Valley, Wyo., have turned the valley into a veritable "Eden" for wildlife. It has become a paradise, too, for sportsmen.

Not long ago the situation was different. Irrigation was practiced, but not too successfully. The water supply was not reliable, and too often the canals and ditches were dry. Without reliable water and the food and cover which water makes possible, use of the valley by many birds and animals as a home was almost out of the question.

The present irrigation development is a joint project of the Bureau of Reclamation and the Soil Conservation Service. This has meant much more efficient use of available water. The result, in an area surrounded by sagebrush, has been a greatly improved home for wildlife, with food, cover, and water in new abundance.

The Valley now is known as the best sage

grouse hunting area in Wyoming. Mourning doves nest in considerable numbers in the irrigated area. Antelope find the project area a desirable habitat.

The storage reservoir, which is stocked with Rainbow and Brown trout by the Wyoming Game and Fish Commission, is an excellent place to fish. Ducks and geese find the reservoir an ideal place to rest on their journeys. The water plants that grow in drainage ditches are food for waterfowl, muskrats, and other water-loving species.

Small marsh areas and natural seeps resulting from irrigation are breeding places for water-loving birds and animals. Mallards, teal and shovellers are common residents. Ditches and the other water areas provide shooting places for waterfowl during the hunting season.

The creek that usually went dry for many years now has year-round flow. This flow is partly the result of recharge of water from conservation croplands.

Windbreaks planted by conservation farmers

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Note:—The author is biologist, Soil Conservation Service, Billings, Mont.



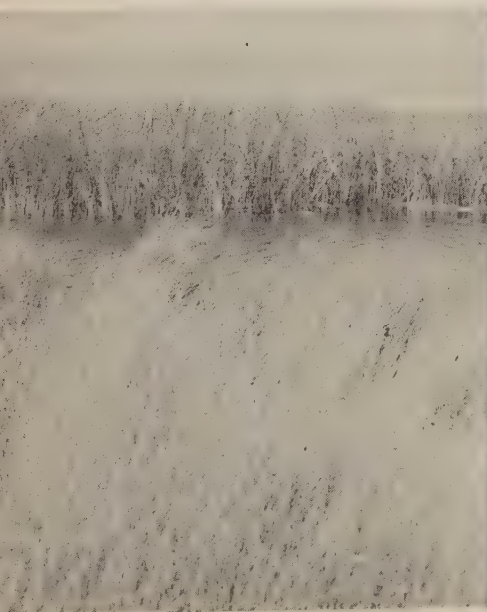


protect farmsteads and livestock and provide food and cover for wildlife. These plantings add variety to the native woody plants found in the valley. Formerly limited to willow and cottonwood, the valley now has caragana, boxelder, ash, Russian olive, conifers, and ornamental species. Woody plantings attract song and insectivorous birds not found in the adjacent areas.

The hay and grain fields, not there before, provide abundant food and cover. Some farmers leave a small area of crop unharvested for the benefit of the birdlife. The conservation-treated fields make it possible for pheasants to live in the valley. The pheasant population, while not large, was enough to warrant an open hunting season in 1958. The surrounding areas have no pheasants.

Folks living in Eden Valley voice pride in the changes they have made with the use of improved irrigation and farming based on sound land use principles. Their "home improvement plan" for wildlife tenants is one of the things they talk about when discussing the things the Eden Valley irrigation project has made possible.

Pictures (from lower left to upper right): Little Sandy Creek, charged with water from irrigated croplands, provides year-round flow; marsh area, developed from seeps, provides a home for muskrats and waterfowl; grain fields and shelterbelts provide food and cover for wildlife; Russian-olive and caragana planting on Eden Valley farm; Hunters reap a sage hen harvest in Eden Valley.





# NEW WATER CONSERVATION RESEARCH LABORATORY

for the Arid Southwest

By Lloyd E. Myers

**T**HE new USDA Southwest Water Conservation Laboratory near Tempe, Ariz., was dedicated in October 1959. The new laboratory has been established to work on critical agricultural water conservation problems in the arid regions of Arizona, Nevada, New Mexico, and Utah. Most of the research will apply to problems on the more than 4 million acres of irrigated land in these States. Many of the research findings will apply, however, to problems in other States. Research will be aimed at discovering new facts about agricultural water use with the objective of using available water sup-

plies more effectively and efficiently.

Planning of the overall research program is being done in consultation with State Agricultural Experiment Stations and the Soil Conservation Service in the four-State area. Actual research projects will be carried out in cooperation with experiment stations, the SCS, and other interested agencies, groups, and individuals. The Laboratory is situated on five acres of land donated by the University of Arizona.

Although the Laboratory buildings have been occupied for only a few weeks, research projects are already underway. This was made possible by a special Congressional appropriation which permitted two senior staff members to

Note:—The author is director, Southwest Water Conservation Laboratory, Agricultural Research Service, Tempe, Ariz.



Main building of the Southwest Water Conservation Laboratory near Tempe, Ariz.

be assigned to the Laboratory in September 1958. Funds for some major equipment purchases also were made available. As a result, problems in the construction of specialized research facilities were ironed out and some of the necessary equipment was available as soon as building construction was completed.

Irrigation water supply problems are increasing steadily in the arid Southwest. Falling water tables, reduction of surface water supplies by droughts, and appropriation of agricultural supplies by municipalities are creating potentially disastrous problems for many irrigated areas. Efforts to develop new water supplies cannot alone solve these problems. Methods of increasing water use efficiency must be developed. Present overall irrigation efficiency is considerably less than 50 percent.

At the present time at least 25 percent of the water diverted or pumped for irrigation is lost by seepage from canals and ditches. Many farm irrigation systems were designed by trial-and-error methods and are very inefficient. Practical, low-cost methods of water measurement are not available with the result that water is not adequately measured on approximately 70 percent of the irrigated land. Reliable and accurate methods are not available for scheduling irrigation times and quantities.

The net result is that in the four States of Arizona, Nevada, New Mexico, and Utah, approximately 4 million acre-feet of water is lost annually in the process of conveying and applying water to the irrigated fields. Some of this water is reclaimed from drainage ditches or by pumping from water tables into which it has seeped. There is little doubt, however, that at least an additional 2 million acre-feet of water would be available for use in these States by increasing irrigation efficiency. The same situation exists, to a greater or lesser degree, in all western irrigated areas.

Research work aimed at increasing irrigation efficiency is underway at the Laboratory. A major effort is being made to develop practical methods for using weather data to accurately determine crop water requirements on a short-term basis so that efficient irrigation schedules and quantities can be calculated easily. The effect of soil and water management practices on the use of water by crops will be studied to see if management practices can be developed



Research engineer observes a low-cost raft used for applying hexadecanol to ponds to reduce evaporation loss.

to reduce crop water requirements.

Work to develop low-cost, practical, and accurate methods of measuring water in farm irrigation systems has been started. Research on the reduction of seepage losses, improvement of infiltration rates of irrigated soils, and the design of efficient farm irrigation systems will be started when additional research workers report for duty. Other research projects are being planned with cooperating agencies to fit problem needs and research resources.

Two-thirds of the stockwater ponds constructed in Nevada have never held water because of porous soils which soaked up all rainfall or let collected water seep out rapidly. This problem exists throughout the arid Southwest where inadequate stockwater supplies prevent full utilization of vast areas of rangeland. The Laboratory has work underway to develop low-cost and effective means of increasing rainfall runoff into ponds and reducing seepage and evaporation losses from them.

## No. 52

This is the fifty-second of a series of articles to appear from time to time in explanation of the various phases of research being conducted by the Department of Agriculture on problems of soil and water conservation.



Research facilities at the Laboratory have been designed specifically for work on water conservation problems. Special installations include a controlled climate laboratory, radio-isotope laboratories, two hydraulic and soil mechanics installations, three controlled temperature laboratories, and an electronic instruments laboratory. The most unusual installation is a set of three electronic weighing lysimeters which are so accurate they can detect a weight change of two ounces in a tank of soil weighing seven thousand pounds. These lysimeters will be used to study the relationships between climate factors and the use of water by crops. Physics, chemistry, and service laboratories; storage sheds; an air-conditioned greenhouse; a machine shop; and adequate office space are also available. These facilities will

allow the use of the latest research methods to solve water conservation problems.

Research equipment will include nuclear radiation devices, radioactive tracers, electrical analogs or models, strain gage instrumentation, precise hydraulic apparatus, automatic data-recording devices, and automatic computers for analyzing data. These research devices will be used in the laboratory and in the field to obtain answers it has not been possible to get heretofore.

At present, the Laboratory has 6 professional engineers and scientists and 11 sub-professional supporting staff members. When fully staffed, the Laboratory will have 20 research scientists and engineers and about 30 supporting sub-professional workers.

### Using snow survey forecasts for

# Water Planning on Irrigated Farms

By Jack N. Washichek

**I**T is important that an irrigation farmer know—before planting time—just how much irrigation water he can depend on. Fortunately, it is possible for most irrigation farmers of the West to know approximately how much water they will have. For several years forecasts of irrigation season flow have been available for streams that depend largely on snowmelt. The water supply forecasting system of the Soil Conservation Service and co-operating agencies furnishes this information as a result of winter and early spring snow surveys. And wise farmers make use of such information in planning their farming operations; they call it water planning.

Of course, an individual farmer has other things besides stream flow to consider in planning his season's operations. How good are his water rights to the stream flow he depends on, especially during years of short supply? Can

he purchase additional water? Does he have a supplemental supply of ground water that he can pump? Can he depend on seasonal rainfall for part of his needs?

These questions and others must be answered in fitting water supply to crops. But an enterprising farmer usually can find the answers and make reasonably accurate estimates as to his total water supply before planting time.

Take the case of Lynnden Fletcher, a co-operator with the West Greeley Soil Conservation District, as an example. One of the farms Mr. Fletcher operates, near Ault, Colo., has 133 acres of cropland. He raises wheat, corn, beans, sugar beets, and alfalfa in conservation rotation on this farm.

Some of these crops need more water than others. According to available research, alfalfa and sugar beets need about 24 inches of water during the growing season. Corn and beans produce well with around 20 inches of water. Wheat requires only 15 inches.

Note:—The author is snow survey supervisor, Soil Conservation Service, Fort Collins, Colo.

The average seasonal rainfall on Fletcher's farm is about 7 inches. This varies from year to year, of course. Nevertheless, Fletcher must use this figure in his water planning; that is, until long-range weather forecasting becomes more reliable than it is at present.

Fletcher gets his surface irrigation water from a local cooperative water supply and storage company that operates the largest ditch diverting water from the Cache la Poudre River. The company also owns a collection system that diverts some water from the headwaters of the Colorado and North Platte rivers. And recently this company has been receiving some water from the Big Thompson River by means of a newly developed diversion. Nevertheless, the records show that the seasonal water supply of this company is closely related to the flow of the Cache la Poudre.

Fletcher has 1- $\frac{3}{4}$  shares in this water supply company. On the average, this company has recently been furnishing its shareholders about 105 acre-feet of water per share. The annual allotment depends, of course, on how much water the company is able to divert and collect under its water rights. If streamflow in the Cache la Poudre is above or below normal, then the water supply of the company is nearly always above or below normal by approximate-



Lynnden Fletcher in one of his alfalfa fields.

ly the same amount, and each shareholder gets his proportionate amount of the available water.

Errors in streamflow forecasts may occur because of unexpected weather fluctuations. But the records show that the flow of the Cache la Poudre has been within 10 percent of the forecast from snow surveys during 8 of the past 10 years. In those 10 years the streamflow varied from about 40 percent to 135 percent of normal.

In addition to his surface water supply, Fletcher has a well and pump that will supply him about 1.4 acre-feet of water in 24 hours. This well is used, however, only to supplement

A general view of the Fletcher farm shows the principal source of irrigation water on the snow-capped peaks in the background.







Corn harvest on the Fletcher farm.

surface flow because the well flow alone is not adequate for efficient irrigation. The company's practice has been to deliver surface water to each of its shareholders about 75 days during the irrigation season. Hence, Fletcher can depend on his well to supply about  $1.4 \times 75$ , or around 105 acre-feet of water each season.

After considering all of these variables in water supply, Fletcher comes out with a reasonably accurate estimate as to how much water he is going to have for his crops. The way he figures it is this: First he subtracts the expected rainfall of 7 inches from the water requirements of a crop and determines how much irrigation water he will need for each kind of crop. For alfalfa or sugar beets this adds up to 24 minus 7, or 17 inches. For corn or beans it comes out 20 minus 7, or 13 inches. For wheat it is only 8 inches of irrigation water needed for a good crop.

Then Fletcher estimates how much irrigation water he will actually have for the season. During a normal year he can expect 105 times 1.75 (the average water per share times the number of shares owned), or about 184 acre-feet from the ditch company. He adds the 105 acre-feet he can get from his well and comes up with the figure of 289 acre-feet. But ditch loss, deep percolation, evaporation, and runoff waste will normally consume about 40 percent of the total.

This leaves about 173 acre-feet available for crops during an average year. Evenly divided, this means about 1.3 acre-feet or 15.6 inches of

water for each of the 133 acres of the farm. This is enough water to give an ample supply for corn and beans on about half the farm with alfalfa or sugar beets on the remainder. Or, he might increase his acreage of alfalfa or beets by planting some wheat.

But, what if the water forecast by the snow surveyors shows that the Cache la Poudre streamflow is going to be only 60 percent of normal? This will mean that Fletcher can expect only 110 acre-feet of water from the ditch company and that his total irrigation supply available for crops will be reduced from 173 to about 128 acre-feet. This is less than 12 inches per acre, and calls for some drastic changes in crop planting plans. Supposing he has 30 acres of alfalfa that he wishes to maintain; then he must plant most of the remaining acreage to small grains if he expects to have adequate water. If he thinks that he should plant some corn, beans, and sugar beets, then he should leave a part of the cropland fallow. He takes market prices, labor costs, and other factors into consideration in making these decisions. But seldom does a wise and experienced farmer like Fletcher go ahead with plans to plant large acreages of water-loving crops and then see them wither and fail for lack of water during critical growing periods.

On the other hand, when the forecast predicts above-normal streamflow Fletcher plans for an increased acreage of the high water users, which are usually the biggest money makers. In other words, this shrewd farmer makes use of the water supply forecasts to increase his profits during the good years and cut his losses during bad years. He calls it water planning for conservation farming.

Farmers who must depend almost wholly on surface water supply for their irrigation needs can make even more profitable use of streamflow forecasts. The present techniques of snow surveying and water supply forecasting are sufficiently accurate to eliminate most of the guesswork about water supply when it comes time to decide on what kind and how much of the various crops to plant. Water planning, of the type done by Lynnden Fletcher, might well be included as an integral part of all conservation plans for irrigated farms that depend mainly on mountain snowmelt.

## DISTRICT PROFILE

J. P. SHEDD  
of  
GEORGIA

**T**WENTY-TWO years ago, the chairman of the Committee on Conservation in the Georgia Senate arose to make a speech.

"Gentlemen," he began, "It is my privilege at this time to report the Committee action on the most important piece of legislation that will come before the Senate during the 1937 session of the legislature."

The speaker was the Honorable J. P. Shedd, senator from the third senatorial district. The legislation he referred to was the Georgia soil conservation districts law.

Mr. Shedd continued, "The bill that I am going to ask you to consider is an act to declare the necessity of creating governmental subdivisions of the State, to engage in conserving soil resources and preventing and controlling soil erosion."

Mr. Shedd was all primed to "give 'em both barrels" but that's as far as he got. A senator spoke up and said, "Go ahead and put your question, Shedd. You know that everyone is for soil conservation."

The senator wasn't to be put off that easily, but every time he started to resume his prepared speech someone called for the question. And the law was soon passed.

"I never did get to make that speech," Mr. Shedd recalls plaintively.

However, during the intervening years Mr. Shedd has given his speech many times. I listened to it recently as I sat in his living room in Bleckley County and I can attest to its being

a fine speech.

Mr. Shedd delights in pointing out that although he didn't get to deliver his complete speech in favor of the districts law, he did talk long enough to make one forecast that is being proved accurate. That was that the rivers in Georgia would run clear again if legislation was passed enabling farmers to cooperate with legalized districts to control erosion.

In 1937 the Ecoree, the Ocmulgee, the Chattahoochee, the Flint, and the other rivers in the State had not run clear for a generation or more; but, said Mr. Shedd, "... enact this law and our rivers will run clear again."

Today, Georgia's rivers have cleared up substantially and are getting clearer all the time. Actual tests up at the Macon waterworks show that the Ocmulgee carries 75 percent less silt than it did in 1937. This is due almost entirely to the shift from row crops to pastures, to the planting of trees, and to better all-around use of the land in the watershed of the Ocmulgee.

"Not only is there less mud," says Mr. Shedd, "there are fish in the Ocmulgee again. At one time all you could hope to catch was a carp or mudcat, or some other rough fish. Now game fish can again be caught in the Ocmulgee."

Mr. Shedd is especially proud of the work that has been accomplished in the Central Georgia Soil Conservation District, of which he is a supervisor. "Not only have yields substantially increased, but the general appearance of the farms is better," he boasts. "You can ride along any road in Bleckley County and see some of the best land and cattle in Georgia. You can see farm after farm where soil and water used to run off in a soupy mixture when it rained, where it now walks off over a carpet of grass. That's why we've got fish in our rivers again."

Mr. Shedd is not farming actively any longer

J. P. Shedd talks about soil conservation to visitors in his home.





because of declining health, but he still lives on the 1,700-acre farm he bought in 1947. Today most of the farm is in trees, a "crop" in which Mr. Shedd is terrifically interested.

"I bought this farm for \$25,000," he says, "since it was mostly cutover land. In the 12 years I've lived here I have sold \$80,000 worth of timber and woodland products, and if I cut it back to the shape it was in when I bought it I could sell \$25,000 more. And, I wouldn't take a quarter of a million dollars cash for the farm.

"I've got money invested in common stocks and bonds, but in my opinion trees are a much better investment. You can't show me many stocks that would have paid \$100,000 in dividends in 12 years and at the same time appreciated from \$25,000 to \$250,000!"

Mr. Shedd is now 83 years of age and lives in retirement except for his church and his district work. He attends all district meetings, including the annual State meeting, and he speaks regularly before civic clubs, schools, and other groups. He is still as sold on soil conservation as he was when he made his first speech for it 22 years ago.

"Districts have put something into farming that was never there before," Mr. Shedd says. "I am proud that I helped to get district legislation passed. I am proud to have been a part of the district movement for 22 years, and I only regret that I won't be around to witness the tremendous impact that it will have on Georgia farming during the next 20 years. Although districts have had the biggest effect on rural Georgia of anything that has ever happened, in my opinion the most far-reaching and profound results are still to come."

—L. J. SISK



**HYDROLOGY.** By C. O. Wisler and E. F. Bratter. 408 pp. Illus. Second edition. 1959. John Wiley and Sons, Inc: New York.

TEN years of classroom use of this textbook have given the authors the experience and information to revise their book. Two new chapters have also been added. Chapter 9

on semiarid regions mainly concerns California, but it will be useful in other mountain-dryland areas. Chapter 10 on snow will be of interest even to the man who does no more with snow than shovel it out of his driveway.

The fundamentals of hydrology are well explained early in the book. The infiltration and unit hydrograph theories are used as basic tools. Working methods are given for use with rainfall, soil moisture, ground water, runoff, and stream gaging. Water losses are given a separate chapter, where the differing viewpoints of agriculturists and downstream river engineers are fairly treated.

The effects of soils and vegetation on runoff are given more emphasis than usually found in hydrology textbooks. For engineers, the authors show a generous appreciation of land use and treatment measures, even going so far as to say (page 342) that "... if properly designed they (terraces) are effective in flood reduction and as a soil conservation measure." Dams and small reservoirs receive adequate, if less kindly, treatment.

Conservationists will find this book worth owning. Its use as a classroom text should not be taken as a sign of a dry-as-dust approach. While the book is technically sound, it is very readable. The authors have taken the trouble to explain clearly the more foggy notions of hydrology, a science that could not exist without its graphs and equations.

—VICTOR MOCKUS

**MANAGING FARM FIELDS, WETLANDS, AND WATERS FOR WILD DUCKS IN THE SOUTH.** By Verne E. Davison and William W. Neely. 16 pp. Illus. 1959. Farmers' Bulletin No. 2144, U.S. Department of Agriculture: Washington.

Helping farmers in the South attract more wild ducks to agricultural land by "farming for waterfowl" is the theme of this new Farmers' Bulletin. The authors emphasize that the key to attracting and keeping wild ducks on a farm is to supply them with food that they like, as well as giving them some open water. The publication describes how farmers can manage food plants, water levels, and other conditions to attract ducks and keep them during the winter months. It also has some pointers for duck hunters.

# Mountain Meadow Improvement

## Mushrooms in Elko County

By L. T. Turner

**C**ATTLEMEN Russel S. Weeks, Kenneth Johns, and their neighbors in the Clover Soil Conservation District near Wells, Nevada, have developed efficient techniques for breaking out native meadows and establishing high-producing hay fields and pastures.

Native meadows have significant disadvantages, including low forage yields and poor feeding qualities. They also have extravagant water requirements and skimpy root systems which use only 1 foot of the soil profile for plant feeding. The continuous irrigation necessary for native meadows also wastes plant nutrients through leaching.

The phrase "wearing out sod" aptly describes many meadow-breaking jobs. In some cases the job has almost worn out the rancher before the land was in good enough condition to seed to grain.

Kenny Johns puts it this way: "My native meadows have a heavy sod developed through years of keeping the land wet by wild flood irrigation. Breaking meadows for reseeded is a hard job; but my improved seedings have quadrupled production, so each year I am plowing up the K. C. Ranch native meadows as fast as I can."

There is usually a nitrogen deficiency resulting from the large amount of organic matter in freshly plowed meadow sod. Hence, Johns and Weeks apply nitrogen fertilizer before plowing to hasten sod decomposition. Johns says: "I apply 33 pounds of available nitrogen per acre as a top dressing before plowing. A year after breaking, little or no sod remains."

Rancher Johns uses an ordinary two-way 18-inch moldboard plow to break meadows. He chooses a time in the spring when the soil moisture is just right for good soil tilth. He cautions that for a good job the plowshares

must be sharp. In fine sandy loam soils he changes shares daily, and in coarse and fine gravelly loam, twice a day. Johns adjusts his plow carefully to cut uniform-width furrow slices. A coulter wheel aids in cutting the sod cleanly.

"I have found from experience," Johns declares, "that if my plow is working properly and soil moisture is right, I can turn the furrow slices over to expose two or more inches of soil and leave little or no grass exposed to light."

Plowing depth is important. Johns attempts to plow just deep enough to turn up sufficient soil for a grain seedbed—about 2 to 4 inches. If the plowing is too shallow there is not enough soil on top to cover the grass, while plowing too deep slows the rate of sod decomposition by burying it too deep for adequate air and soil warmth. Deep plowing also raises costs by re-

Moldboard plows work well in turning under sod in the spring when soil moisture is right.



Note:—The author is work unit conservationist, Soil Conservation Service, Wells, Nev.





Kenneth Johns inspects a grain seedbed prepared by plowing, harrowing with a disk harrow, and dragging.

quiring more power and causing heavy wear on equipment.

Johns stops after plowing 3 to 5 acres and works the land with a disk harrow and lumber drag. This prevents undue soil drying. The soil moisture available then assists the harrowing and dragging operations to pack the sod tightly against the plow sole and so spread the soil uniformly on the surface.

Disk plows are best for breaking up sod in the fall when the soil is dry.



"When I wait a week or more after plowing, I have found that meadow grasses will take root and grow at the junction of the furrows. To prevent this, I plow in the morning and disk harrow in the afternoon."

Johns completes his grain seedbed preparation by disking and dragging twice, both with and across the furrows.

Many Elko County meadows too wet for spring plowing are bone dry after haying in the fall. Plowing at this time must be done with disk plows since the land is far too dry for moldboards. Russel Weeks gets good results with a 28-inch disk plow set to cut 10 inches deep.

Russel says: "Before plowing, I chisel my old meadows with the teeth set 2 feet apart and digging 12 inches deep. I then plow at right angles to the chisel marks; this helps the disk plow to tear up old meadows."

In the spring, Weeks replows disked meadows with a disk plow and works the land with a disk harrow and drag to form a satisfactory grain seedbed. He says: "On the second plowing operation better results are obtained by working at right angles to the first plowing."

It is usually necessary to grow two grain crops to thoroughly kill the meadow sod. Many



ranchers level their meadows after the first grain crop. Leveling equipment works much easier after the sod is decomposed, and there is less settling in the fills. In applying water to the second grain crop any unevenness in leveling can be located and can usually be corrected with a landplane.

Weeks sprays his grain with herbicides to control the bothersome native weeds that often persist and cause trouble in new alfalfa and grass seedings.

Another essential to success in meadow improvement is water control. In furthering this program, SCS technicians in 1958 surveyed 18.3 miles of irrigation ditches in the four soil conservation districts served by the Wells office.

Service engineers in 1958 staked 1,300 acres on 20 ranches for leveling to planned grades. This is the largest amount leveled on soil conservation district cooperators' lands in 13 years of SCS activity in Elko County.

Conservation ranchers Weeks and Johns know that water application, according to the needs of plants, is highly important. Water-loving native plants have their roots practically

on the surface, or no deeper than a foot, and require almost continuous irrigation. Deep-rooted alfalfa and grasses on moderate to deep loam soils require irrigation only every 20 to 30 days. Good soil drainage must be provided to maintain high production of the better quality grasses and legumes.

For permanent hay, Weeks likes Ranger alfalfa and intermediate wheatgrass for his better drained lands, and on slightly wet land, alfalfa, alsike clover, Reed canarygrass, and smooth brome.

Johns has had good results with Taulatin tall oatgrass, Ranger alfalfa, and Manchar smooth brome.

This type of meadow improvement involves fertilization, breaking out native sod, seeding grain, irrigation system improvement, land smoothing or leveling, and plenty of hard work. The program is now rolling in high gear in Elko County.

Weeks, Johns, and many other Elko County ranchers have reported yields from well-managed improved meadows to vary from 2.5 to 6 tons per acre with averages of 3.5 tons. For

Ranchers visit an improved mountain meadow during a soil conservation tour in the Clover Soil Conservation District.





Elko County's 154,000 acres of native meadow, which now produce about a ton per acre, a phenomenal potential increase is indicated.

In full production, the improved meadows will yield an estimated 539,000 tons of hay as compared to a present production of 154,000 tons. The increased hay would feed about 336,000 beef cows for the 4-month winter feeding period as compared to today's 96,000 head.

### **New Sedimentation Laboratory**

A new sedimentation research laboratory of the Agricultural Research Service was dedicated at Oxford, Miss., in November 1959. The laboratory's main job will be research on sediment movement in streams. Among other equipment is an adjustable flume 100 feet long, 4 feet wide, and 2 feet deep that can duplicate the velocity and carrying capacity of water in streams common to the area. The ARS scientists hope that a correlation between field and laboratory measurements at this station will lead to the discovery of laws that will explain the transporting and deposition of sediment by streams.

The fifth World Forestry Congress is to be held on the campus of the University of Washington, Seattle, Wash., August 29 to September 10, 1960. The United States Government is the host to the Congress. The Food and Agriculture Organization of the United Nations and other agencies are cooperating.

A bank in Hancock, Md., is conducting a year-long planting contest for the landowners in its area who plant the most trees. The top prize will be \$125. The smallest area eligible is 5 acres.

A total of 660 incentive awards amounting to \$87,700.62 in cash was given SCS employees during fiscal year 1959. The Service paid employees \$6,704.97 for 152 work-improvement suggestions, which resulted in estimated savings of \$98,206. It rewarded 60 special acts or services with cash payments of \$3,967, which resulted in estimated savings of \$77,020. Sustained superior performance awards totaling \$77,028.65 were given to 448 employees.

During fiscal year 1959, the SCS automotive fleet of 11,078 passenger cars and light trucks traveled more than 102 million miles at an average cost of 5.27 cents per mile, including overhead and depreciation.



APRIL 1960

# Soil Conservation





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*"Every human enterprise is the blend of a bit of humanity, a bit of soil, and a bit of water."*

—JEAN BRUNHES



COVER PICTURE.—Floodwater detention dam on East Willow Creek watershed in Fillmore County, Minnesota, with conservation farming practices shown in background.

# Soil Conservation

EZRA TAFT BENSON  
Secretary of Agriculture

DONALD A. WILLIAMS  
Administrator, Soil Conservation Service

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TOM DALE, Editor

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# A Watershed is People, Too

*And the People along Mill Creek have "Watershed Religion"*

By Roy H. Dingle

A watershed may include farms, forests, highways, bridges, railroads, factories, homes, towns, and many other things. But above all, it includes people. And the way the people think and act usually determines what kind of watershed it is. At least, that's the way the folks who set out to stop the plague of floods on Mill Creek found it.

Mill Creek runs southward through Richland County in western Wisconsin. Its east and west forks converge just above Boaz, a village with a population of about 300.

When Boaz was all but washed away by the 1954 flood, members of the village board saw a possible solution. A straightened stream, they reasoned, would carry more floodwater than crooked, choked-up Mill Creek. But the board could not authorize work outside the village limits. So it asked President Frank Harris to seek the cooperation of Dayton township in a stream-straightening project.

George Smart, chairman of the township board, had a different idea. As a soil conservation district supervisor he had seen flood prevention work in neighboring Vernon County. He knew that when a stream is straightened, it sometimes increases damage farther downstream. He suggested that conservation of the land and the water upstream was the best solution.

At a meeting called to consider flood prevention and watershed protection, about 60 people listened to County Agent John Wilson and me outline a suggested course of action. There was no promise of immediate results. Everyone understood this would be a long-range job. The group chose nine temporary directors, making Frank Harris their first president. Thus the Mill Creek Watershed Association was born.

The new directors studied the watershed. They learned its exact boundaries. They listed the names of the people and discovered happily that sixty percent of the farmers were cooperators with the Richland County Soil Conservation District. They studied tributary streams to learn the value of the resources that were being damaged by floods. They wrote a constitution, enlisting the help of E. O. Baker, erosion control agent of the State Soil Conservation Committee.

They learned from Baker what information would be needed in an application for help in developing a watershed plan. The constitution was soon adopted, the temporary officers made permanent, and the lower boundary of the watershed determined. Now people began to take more interest.

To help collect flood loss figures a committee designed a questionnaire, listing all types of flood damage. Then the board of directors, each with a helper, went from house to house interviewing landowners. Farmers, business people, and village residents reported their damages from floods of 1951 through 1954. Town boards, the county highway department, and public utilities also reported. On the final evening the directors and their helpers, with a battery of five adding machines, worked far into the night to convert these individual reports into watershed-wide damage estimates.

**Soil conservation district supervisors and watershed directors meet together to plan the Mill Creek watershed project.**



Note:—The author is work unit conservationist, Soil Conservation Service, Richland Center, Wis.



During this time a conservation needs committee worked with SCS soil conservationists. Using conservation plans and records of farms, they determined how much conservation work was done on the land and how much was needed. They learned that Mill Creek had a fine conservation record but that much more would have to be done.

Nearly a year after its first meeting the watershed association was ready with its request to the soil conservation district supervisors. The district completed the watershed application and sent it to the Governor.

A task force from State and Federal agencies soon made a field examination of Mill Creek. Their findings were favorable. So when the SCS State conservationist sent the application to Washington, Mill Creek was quickly approved for planning.

An SCS watershed planning party reported that eight to ten floodwater retarding structures could be justified and suggested that arrangements be made for

funds with which to buy easements and rights-of-way. The watershed association then asked the Dayton, Akan, Sylvan, and Marshall Townships, the village of Boaz, and the county to raise the needed money jointly.

Appropriating large funds for a small corner of the county was a revolutionary idea for the county board. It was a new venture for Boaz and the townships, too. At a joint meeting to discuss all angles of the project, Foster Patch, watershed association president, advanced two basic principles to justify appropriation of funds by the respective governmental units. First, the flood problem was county-wide. Second, the people benefited would eventually repay in taxes all that was expended for their benefit. Protection from flood damage would increase the value of their properties. The tax base would be protected and increased.

The planning group, recognizing the merits of these principles, suggested that the County be asked to appropriate \$7,500 and the town-



**The president of the watershed association and a district supervisor sign the application for Federal assistance on the Mill Creek watershed.**

ships, with Boaz, an equal amount. Boaz was asked for \$1,500. The remaining \$6,000 would be appropriated by the 4 townships in proportion to the watershed area in each. The municipalities each voted the requested funds.

Then the problem of easements came up. For the first try, the upper dam of two in a series was selected. It was to be on the farm of an absentee owner but one known as a conservationist. He assented readily. Although he would not benefit from the dam, the damages to his farm would be light.

But the absentee holders of a mortgage on this farm had to be consulted also. They were anxious to get their money out of the farm and suggested damages of \$5,000 for the easement. Ten acres of land were affected, all lying in a forty valued at \$1,000 in the assessor's books. It was permanent pasture-land that might actually benefit from increased yields of grass after seedings were reestablished.

A second farm was involved at this dam site. The farm belonged to several individuals, most of whom lived out of the State. It proved to be impossible to meet with these people.

It soon became clear that easements could not be obtained on a voluntary basis. The soil conservation districts law in Wisconsin

**Farmers, businessmen, and housewives line up to sign the application for Federal aid on the Mill Creek watershed protection project.**





explicitly denied districts the right of eminent domain. The ruling principle had been that soil conservation should sell itself on its own merits. But watershed protection and flood prevention were new ideas. Here was a plan for community protection at the cost of damage to a few individuals. Should individuals have power to stop such a community project?

New legislation was clearly needed and the district supervisors sought the help of friends of the project. After several trips to Madison and discussions with many key people, the necessary legislation was introduced by Richland County's own State Senator, Jess Miller. Both houses unanimously passed it. Now the district supervisors had the power to condemn land.

Next, the supervisors visited all structure sites to determine fair damages for each landowner. In preparation for this work standard values of land were set, based upon land capability and present land use. Acreages subject to damage and extent of damage were estimated. A tentative schedule of damages was set for each landowner. Total tentative damages were kept well within the limits of money appropriated.

Now the full-scale job of obtaining easements began. It proved most disillusioning. There were twenty landowners to see. Agreement was reached in very few instances on the first call. It seemed almost impossible for those being damaged to dispassionately agree on a fair value for the land. All too frequently their comments were, "If my neighbors below are going to receive so much benefit, why should I not be paid accordingly? If so much money is going to be invested in this dam, the land on

which it is going to be built should be valued accordingly." But finally commitments for easements were obtained for the two small dams in the west branch of Mill Creek.

While the supervisors were busy on easements, the State highway department let a contract for highway relocation and bridge construction affecting one of the dam sites. Fill for the proposed dam would be about eight feet deep above the proposed highway. Something had to be done at once. A discussion of the problem with the County Highway Committee quickly followed. SCS and State highway engineers were informed of the problem.

The highway department was sympathetic with the watershed program and could see that by relocating the highway to make room for the dam, savings in bridge costs could be realized. Since the dam would greatly reduce runoff, the size of the bridge could be reduced. Highway engineers agreed to delay the start of construction when the SCS promised to have plans ready for the dam so that construction could be done simultaneously on dam and bridge.

But buying the easement for this dam proved expensive. The owner would lose most of his valley cropland. His demands were reasonable, however, and agreement was reached. The supervisors were concerned about possible additional costs of the highway relocation around this dam. This cost plus the easement might be embarrassingly high. Their apprehension was relieved, however, when they learned that savings on bridge costs were more than enough to cover the added highway costs. At last it seemed that Mill Creek's luck had changed for the better.

Plans for the first dam were completed and the bids opened in August 1958. Four years to the day from the date of the first meeting to discuss a Mill Creek watershed project, construction was started on the first dam.

No better earthmoving season ever came to Richland County than the summer and fall of 1958. It rained just enough to moisten the soil without stopping the work. The first big dam—all 55,000 cubic yards of it—was completed except for seeding.

Outlet of the Ewers Dam, first of the flood prevention structures completed in the Mill Creek Watershed.





With one dam built and seven to go, everyone now is sure that the project will be completed.

But a watershed project is complete only when it has a going land treatment program to support the structural program. Fortunately, this has not been a serious problem in Mill Creek. More than sixty percent of the farmers in the watershed were conservation farmers at the outset. Since the watershed program's beginning, there have been 36 new cooperators. Basic conservation plans have been developed with 37 cooperators. More than 1,600 acres of contour strip-cropping have been established, 700 acres of woodland protected from fire and grazing, 900 acres of pastureland protected from overgrazing, and 60 acres of wildlife areas improved. Three miles of terraces, three miles of diversions, and a mile of grassed waterways have been constructed. Four miles of



Watershed association members picnicking on the Boaz school grounds.

streambanks have been protected.

The major land treatment problem has been the woodland. But Mill Creek people have been equal to this task too. They have trebled the acreage of woodland protected from fire and grazing since their organization. "Sugar bushes" for maple syrup have been reopened in

the past few years.

Conservation is now a part of living along Mill Creek. Newcomers soon learn that they are expected to farm the conservation way. This is undoubtedly one of the greatest values of the program—it has created what might be called "watershed religion."

## TEAMWORK ON DRAINAGE RESEARCH

By William W. Donnan

**S**URVEYS show that there are about 8 million acres of irrigated land in the West needing drainage and another 8 million acres that would benefit materially from better drainage practices. In addition, many thousands of acres of highly productive land is faced with the potential danger of becoming waterlogged.

The question might be asked, "Why not drain those lands?" The answer is that in many areas we

don't know how to drain them. We don't know the cause or the cure! The scientific knowledge of how to drain those areas can only come about through research and the practical application of research principles.

More and more it is becoming apparent that, when water is applied to the land artificially, drainage problems are created. The complex nature of the soils, crops, climates, quantity and quality of water supplies, and irrigation practices make the solution of drainage problems

difficult.

When research has been concentrated on a given area or a given

### No. 53

This is the fifty-third of a series of articles to appear from time to time in explanation of the various phases of research being conducted by the Department of Agriculture on problems of soil and water conservation.

Note:—The author is agricultural engineer, Agricultural Research Service, Pomona, Calif.

problem, the results nearly always have been rewarding. In 1941 a team of operations and research technicians from the Department of Agriculture was sent to the Imperial Valley of California to work on that area's drainage problems. Careful investigations, together with trial and application of techniques, have resulted in the reclamation of 50,000 acres of land. Another 100,000 acres has been improved. This means an aggregate increase in return to farmers of about \$1 million per year.

Techniques developed for the solution of the Imperial Valley drainage problem have found wide use elsewhere. One example is the use of piezometers in many areas to detect ground water levels and to chart the movement of seepage flow or hydrostatic pressure head. Piezometers were not "invented" in Imperial Valley, but through research and application their use was perfected and adapted to drainage problems. Later, by means of seminars, workshops, and training conferences, the piezometer technique and other scientific principles were given widespread application and trial. This training required teamwork between the Soil Conservation Service and Agricultural Research Service.

In the Firebaugh Soil Conservation District in Fresno County, Calif., there is another example of teamwork to solve drainage problems. In 1953 the people in the Firebaugh-Mendota area organized a soil conservation district. They requested technical assistance in the investigation of drainage problems. This district was provided with a team of SCS and ARS technicians, who made a full investigation. The solution called for a trunk open-drain system and individual farm tile systems designed for specific site conditions.



**ARS and SCS seminar group at a demonstration on how to install and use piezometers.**

Since there were no tile-laying machines in the area, a team of SCS, ARS, and district men visited tile contractors in other areas to see which type of machine would be best for the local conditions. Shortly thereafter the Firebaugh Soil Conservation District bought its own tile-laying machine. Today they can point with pride to the many thousands of feet of well-designed and properly installed tile drains. Land valued at \$500 to \$700 per acre is being safeguarded, and the money invested in drainage is paying big dividends in better crops.

Other places where teamwork on solving drainage problems is now in progress are at Fallon, Nev.;

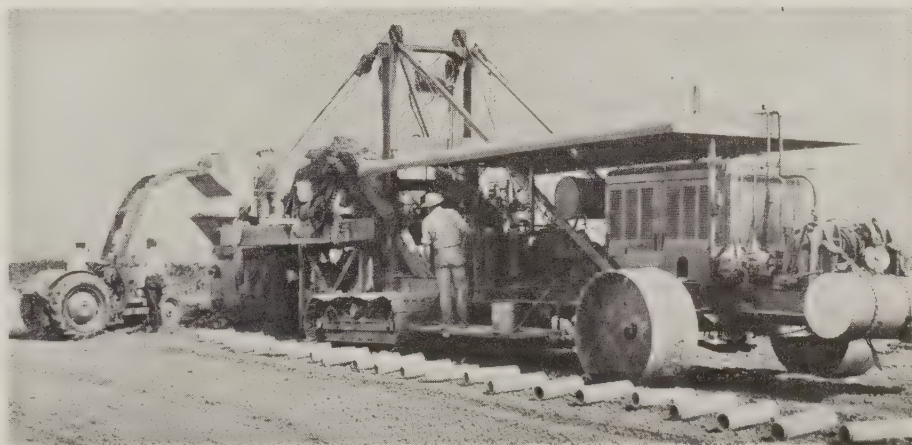
Logan, Utah; Grand Forks, N. Dak.; Fort Collins, Colo.; and the Lower Rio Grande Valley of Texas. The SCS, ARS, and local people at all these locations are working together to solve drainage problems.

Perhaps one of the most significant examples of teamwork between SCS and ARS occurs in the "Research Needs" program. This program simply means that SCS and ARS get together to determine what the most important technical needs are. In other words, what type of research work should ARS be doing which would be beneficial to SCS? Here are some examples of the way the "Research Needs" program is working in the field of drainage.

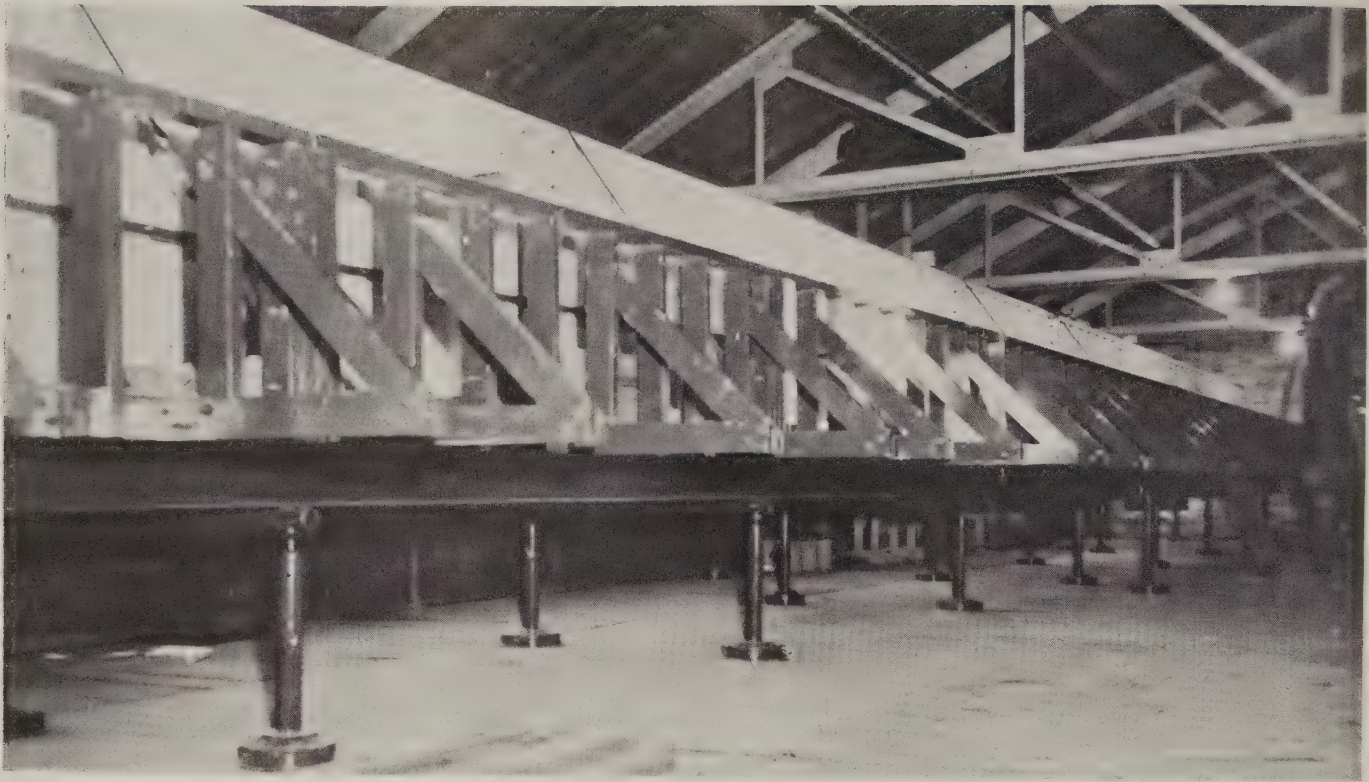
In 1954 SCS technicians came to ARS and said, in effect, "We need more information on interceptor drains. How deep should a drain be placed? How far up slope and down slope will a drain be effective? How much water will come out of the drain?"

To answer these questions, the research men worked out theories on how an inceptor drain should work under a given set of conditions. Then they built a large wooden tank 80 feet long, 2 feet wide, and 5 feet deep in the Hydraulics

**Tile laying machine owned and operated by the Firebaugh Soil Conservation District.**







Tilting, 80-foot-long wooden flume set on jacks and filled with sand for research studies on interceptor drains.

Laboratory at Colorado State University. The tank was built on screw jacks so it could be set on various slopes. When completed, the tank was filled with sand and interceptor drains were installed.

After testing for 6 months, the ARS technicians had most of the theoretical answers on how an interceptor drain functions. Then by teaming up with SCS and the Colorado Experiment Station they took their theories to the field and made practical application and tests on a dozen or more field installations. These techniques and principles now can be applied almost anywhere in the West.

In 1957 SCS said, "We need a better device for measuring hydraulic conductivity. We want an easy, workable method for finding out how fast the water moves through the soil to the drains."

After many trials with various

devices, and after much consultation and help from SCS, the research engineers have developed a simple screen, well-point device. This tool is now being given extensive tests in the field by SCS technicians and holds promise of giving excellent results. It will enable SCS to make better on-the-farm investigations of drainage problems and thus help solve those problems.

Other drainage research needs which are high on the priority list for future attention are: (1) Design criteria for open ditches for western conditions, covering such factors as drainage coefficient, side slopes, hydraulics, and investigational methods; (2) Practical methods for estimating quantities of flow to be expected from tile and open drains; (3) More research on gravel envelope filters and other types of filters for drains; (4) Value of "n" for Manning's for-

mula for use in design of tile drains; (5) Protection of drains laid on steep grades; (6) Effects of depth of water table and rates of drawdown on root development and crop growth; and (7) A review of effectiveness of drainage installations in the Imperial Valley.

Research costs money, and returns on the investment can only come about through application of principles to problems. This is why teamwork is so necessary. We can't afford to conduct research and merely write a report. We must carry those research principles to the field and give them tests under field conditions.

How much can we afford to spend on drainage research? If a few cents per acre were spent on drainage research each year on the 8 million acres of land now actually needing drainage, a well-rounded program could be implemented.



# The Water Conservation Postage Stamp

**T**HE fact that water is a vital and limiting natural resource is dramatized by the latest in a series of conservation commemorative stamps—the 4-cent water conservation stamp to be issued in Washington, D.C., on April 18, 1960.

The unique two-panel stamp portrays a closeup view of a drop of water falling from a leaf, which symbolizes watershed influences upon water supply. This design leads the eye to a right-hand panel depicting an actual watershed panorama. A town and farm in the foreground are dependent on the upstream watershed with its well-managed farm and forest lands

and dams for flood prevention and water storage.

Our national and personal needs for water for domestic use, for sanitation, for manufacture, and for agriculture are multiplied each year by our expanding population.

But there is just so much water. The earth's water supply remains constant. We can meet these vital and rising demands for water only by better use of what we have—by reducing needless waste and pollution—by protecting the watershed upon which our water falls as rain and snow—by finding more efficient ways for its use.

Most problems of water shortage, poor water, or floods trace back directly to the land.

Whether the land in each watershed is eroded or is mantled by a protective cover of grass and trees—whether there are small dams and other flood-preventing structures along the channels—whether steps have been taken to reduce pollution—these determine in a large measure whether water supplies are ample and reliable.

It is because of the dependence of water supply on watersheds that the commemorative stamp will be formally issued at the 7th National Watershed Congress in the Nation's Capital on April 18.

The new water resources commemorative stamp will be available in local post offices on April 19, the day following its official issuance.





# Tile Drainage For Citrus

By R. G. Jessup and D. P. Ventulett

**T**HE ever-increasing demand for citrus fruits and the decreasing availability of good citrus land are forcing growers to plant on land considered marginal for citrus production. These lands present such hazards to citrus growth as extreme temperatures, excessive surface and subsurface water, unfavorable soil characteristics, or combinations of these. It is therefore increasingly necessary to select carefully the land that offers the least hazards and try to overcome the hazards that do exist.

H. D. Maguire of Winter Garden, Fla., is trying to solve his problems by choosing lands with a high water table and draining them.

Some years ago Maguire set out 20 acres of citrus on land with a high water table. Due primarily to lack of drainage, this planting was

a failure. But because well-drained land in this area sells at premium prices, he decided to try again on the 20-acre block. Maguire, now a cooperator with the Orange Soil Conservation District, requested technical assistance from the Soil Conservation Service for this second undertaking.

The first step in planning was to make a detailed soil survey of the area. The soil was mapped by SCS soil scientists as a fine sand with capability classification IIsw. It is a fairly level, deep sandy soil high in organic matter at the surface. The surface is underlain by a weakly developed organic stained pan. The normal depth to the water table is 18 to 24 inches. Although this soil is too wet for citrus in its natural condition, the texture is such that it drains readily when the water table is lowered.

The next step was to make a field

engineering survey and prepare a topographic map of the 20 acres. The topographic map and the soil survey served as the basis for designing the drainage system. Because of the topography, high water table, and soil characteristics, it was determined that both surface and subsurface drainage would be best.

Plans for surface drainage included perimeter ditches, low beds, and pipe drops. The perimeter ditches were designed deep enough to serve as seepage cutoff ditches and to provide outlets for the sub-drainage system.

Tiling was selected as the best method of drainage to permit maximum depth for root development with the least loss of land. The planned tile system consisted of nine lines of 4-inch pipe, spaced 120 feet apart. Each line was 516 feet long. The depth ranged from 3.0 to 4.4 feet with the tile grade designed at 0.3 percent to provide for a self-cleaning velocity of flow in the tile lines.

An estimated cost-benefit determination for the project was also made by the SCS technicians. Mr. Maguire considered all the factors and in May 1959 decided to proceed with the project as planned.

Maguire selected a bituminized fiber drain pipe as the type of tile to be used. This pipe is made in 8-foot sections with two rows of  $\frac{5}{16}$ -inch holes spaced 3 inches apart along its length. It is joined together by split couplings.

The wetness of the soil caused a

Note:—The authors are, respectively, agricultural engineer and area conservationist, Soil Conservation Service, Orlando, Fla.



Furrow plowed for alinement of tile ditch on the Maguire place with materials stockpiled along the line.



soft foundation so it was decided to use a 4" x 18" blanket of washed and well-graded gravel as the filter and stabilizing material under the tile. A layer of sawdust 8 inches thick and 18 inches wide was used as the filter over the tile.

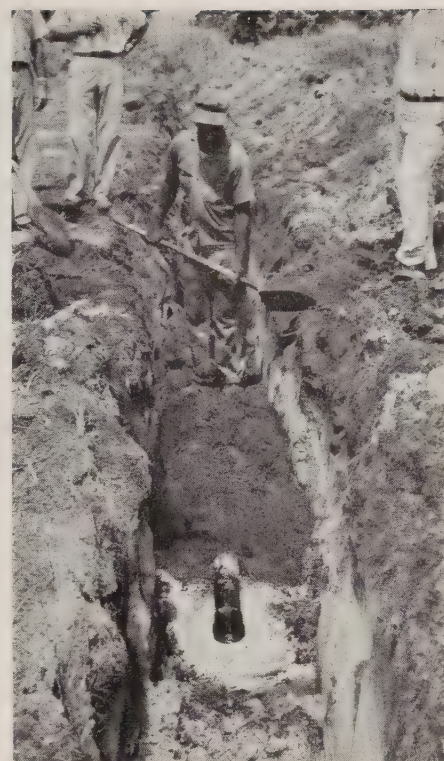
The perimeter ditches were surveyed, staked, and constructed prior to tiling. The spoil from the ditches was used to fill in low areas in the field. The tile lines were then laid out with center line stakes and offset grade stakes every 50 feet so that proper tile grade and alinement could be maintained.

Several different types of equipment were used in digging the trenches, as local dealers cooperated in making this installation a field demonstration for other interested growers. The back-hoe was considered the best-suited implement where wet conditions were encoun-

tered, while trenching machines worked best where trench bottoms were at or above the water table.

The crew required to properly install the tile included an equipment operator, two laborers, and a job foreman. SCS technicians provided assistance in checking the grade and seeing that the job was constructed as planned.

Construction of the trenches was done by starting at the outlet ditch on grade for the first 24 feet where three joints of nonperforated pipe were used as the end section. From this point the trenches were excavated 4 inches below grade and backfilled with the gravel filter. The pipe was then carefully placed to grade on the gravel, making sure that the drain holes were down and that the couplings and pipes fitted snugly. Then sawdust was placed over the pipe and approximately 6



**With tile and sawdust filter in place, laborers shovel in about 6 inches of soil and tamp it to bind the tile.**



**Tile installation on the Maguire place with gravel bed underneath tile and sawdust filter over it.**

inches of soil was shoveled in by hand to properly bind the pipe in place. After the tile binding was completed the trenches were back-filled and smoothed to the original ground surface by the blade attachment on a tractor.

Also needed to make the job complete were manufacturers' caps for the upper ends of tile lines, screens for the outlet ends, and a small sand-cement bag headwall to protect the end of each tile line where it emptied into the open ditch.

Tile lines properly installed, as these were, usually require little maintenance. But the tile outlets should be checked after heavy rains to make sure that they have not become clogged and that the outfall ditch is functioning properly.

The total drainage cost of ditches, structures, and tiling was approxi-



mately \$218 per acre drained on the Maguire place. If this cost were ammortized at 4½ percent over a 25-year period and an annual ditch maintenance cost were added, it was estimated that an annual production increase of less than 1/3 box of oranges per tree would pay for the drainage system. Mr. Maguire is confident that larger

trees resulting from deeper rooting will more than provide the extra production to offset the cost.

With an increasing demand for citrus fruit and a large amount of wet land being planted to fill this demand, tile drainage offers one of the best methods for making these plantings profitable. Even though the initial cost is higher than other

methods of drainage, it is not necessarily the least profitable. On the contrary, tiling may well be the most profitable over the years by providing for deeper rooting and permitting larger trees with greater production capacity. Tiling also leaves for trees land that would otherwise be taken up by open ditches.

# More Grass The Elko Way

By Herb Boddy

**T**HOSE up-and-coming ranchers in Nevada's Pilot Soil Conservation District are getting just what they went after six years ago—more grass.

Today, with about a fifth of the big public and private range-building job done, praise is due all hands—ranchers and State and

Federal agencies who pitched in and made the "grass revival" go.

The late A. H. "Speed" Agee started things off. At the 1950 Atlanta convention of the National Association of Soil Conservation Districts, he sold the gathering of farmers and ranchers on the idea of public agencies and landowners working out tough range problems team-style.

The next year at Oklahoma City, Speed was successful in getting the Association to set up a "Public Land Committee" with the chief job of grassing-up western rangelands. At its first session, the committee urged the selection of pilot districts in each of the 11 western States.

Pay a visit to the two-million-acre Northeast Elko district and

Note:—The author is information specialist, Soil Conservation Service, Berkeley, Calif.



Ranchers of Northeast Elko SCD inspect the huge area of potential grassland in their district while making plans for improvement through sagebrush removal and reseedling.



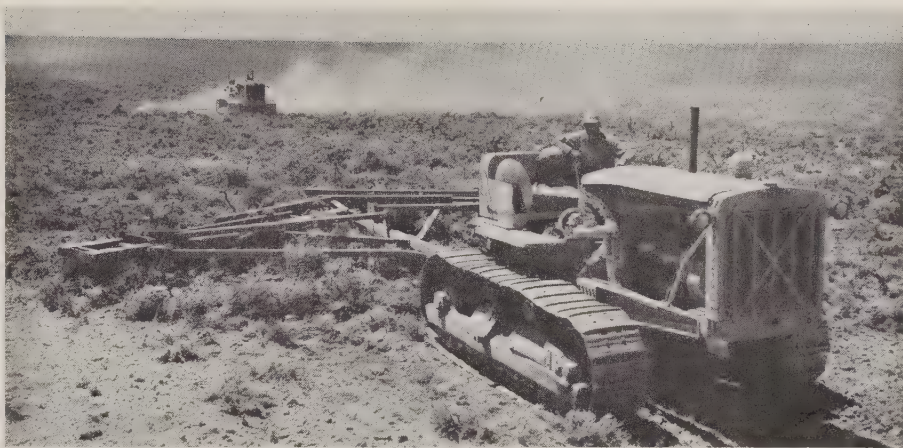
you'll find plenty of signs of team action. New grass oases are reaching out. Stock ponds are handy to grazing areas. And miles of new fencing provide grazing safeguards. Conservation work of all kinds is going on. You get the feeling that these rancher-conservationists have touched off a genuine range renaissance in the West.

Of course, not all range acreages are as plush-looking and productive as some of the new grass stands. And many more miles of fencing, plus lots of stock ponds and other improvements are needed. But the ranchers have set their goals and time is on their side.

District leaders and officials of the cooperating agencies—Bureau of Land Management, Soil Conservation Service, Forest Service, Agricultural Conservation Program Service, U.S. Fish and Wildlife Service, Nevada Fish and Game Commission, Nevada Department of Agriculture, and Nevada State engineer's office—would like to move ahead faster. But appropriations, technical assistance, and ranchers' pocketbooks pretty well set the pace.

Fact-finding and planning by technicians laid the groundwork for the range improvements. First, a team of State and Federal specialists prepared a Coordinated Land Program Report of the district's needs and resources. Next, ranch conservation guides for the district's five grazing units were completed. Guides included information on soils, condition of range plants and needed reseeding, stock-water developments, fencing, weed control, and other conservation practices.

The final stage of pilot planning called for preparation of individual ranch plans for each of the district's 34 ranches. Plans included



**Plowing big sagebrush range in preparation for seeding grass in the Northeast Elko Soil Conservation District.**

schedules for getting the pasture management and conservation measures applied to the land.

Nearly all of the Northeast Elko district is range, and most of it is Federally-owned. It's high country and the growing season averages only 95 days.

In that setting, district chairman Eyer Boies figures irrigated hay and pasture yields can be stepped up six times, range production twice. There'll be plenty of top quality forage, too, for turning out early-maturing, heavyweight cattle.

Calculating gains another way, a complete soil, plant, and water

management program could boost grazing by cattle and big game from 234,447 — today's mark — to 557,855 AUMs. That 138-percent increase would feed a good many more head. (An AUM is enough forage to feed one mature cow and calf for a month, or approximately 800 pounds of air-dried, nutritious forage.)

This increase of 323,408 AUMs, if converted into cattle, would mean roughly 21,550 breeding cows, 1,100 bulls, and 4,300 replacement cattle. That number of cows should produce around 15,085 calves, allowing for a calving rate of 70 percent.



**Cattle grazing crested wheatgrass that was seeded on former sagebrush range in Elko County.**





Alfalfa-brome grass hay field on the Eyer Boies ranch

From this calf stock, count on a loss of 5 percent or 755. So we end up with 14,330 head of 400-pound weaners for sale or replacement. That adds up to 5,732,000 pounds of beef—which at the present sale price of 28¢ would give ranchers about \$1,603,960 new income.

A “guesstimate”? Sure! But cattlemen like Eyer Boies, Harvey Hale, Clarence Elquist and H. Vance Agee will tell you there’s nothing far-fetched about this reckoning. AUMs are climbing steadily.

So far landowners and public agencies have spent roughly \$1.3 million of the estimated \$6.9 million cost for completing the job. And they’re running a bit ahead of the 35-year completion date that was set by the long-range planners.



Bulldozer-built stock pond on the Salmon Falls River Cattlemen’s Association range in Elko County.

Range seedings in the mile-high country are making good headway. Even so, assisting technicians are seeking more palatable, higher-yielding, and larger-growing grasses to increase forage supplies.

For seeding big sagebrush range, in the 8- to 10-inch precipitation belt, crested wheatgrass is now the best bet. Crested produces an average of 250 pounds of usable forage and 15 pounds of beef per acre. Depleted big sagebrush range averages a scant 50 pounds of feed and three pounds of meat per acre.

Crested wheatgrass fields look especially good on the Winecup ranch south of Wilkins, the O. F. and Eyer Boies ranch south of Contact, and the Salmon River Cattlemen’s seedings north of there. Whitmar beardless and bluebunch wheatgrasses are highly promising for similar areas.

In the 10- to 14-inch rainfall zones, intermediate and whitmar beardless wheatgrasses are showing promise. Both are more palatable than crested, can be grazed later in spring, and stay green and succulent well into summer.

Siberian wheatgrass is proving the best grass for droughty big sagebrush areas having less than 8 inches of precipitation. It’s a little more hardy than crested, and seedlings take root easier.

Tall wheatgrass looks promising on salty sites having supplementary moisture by natural sub-irrigation or applied water.

High-quality winter hay is grown mainly from two mixtures. A mixture of Ladak alfalfa and intermediate wheatgrass is well-suited to the district’s poor summer irrigation water supplies. With full-season irrigation Ranger alfalfa and Manchar alfalfa have given excellent yields. On slightly wet lands a mixture of Ranger alfalfa, alsike clover, reed canary-

grass, and manchar smooth brome is the choice.

A lot of the progress in this pilot district can be attributed to the new form of grazing allotments. For years groups of ranchers shared the public range together. Now that individual grazing rights are assigned, new opportunities are offered for ranch planning. Cattlemen can fence their allotted space and tackle range problems with the assurance that they’ll reap returns from their conservation work.

All of the district’s ranchers are actively and enthusiastically backing the range-building program. The last hold-out rancher finally joined forces after five district people called and explained pilot aims.

There’s a good deal of plain talk going around about this undertaking.

Eyer Boies says his cropland program added 500 tons of hay and range seedings added 1,350 more AUMs. New feed relieved overgrazing.

Harvey Hale raised his hay output from 100 to 250 tons by better irrigation and crop and soil management. And he’s gotten more grazing, too, by seeding range and pasture grasses.

Converting native meadows to better-paying haylands and seeding big sage land to wheatgrass really helped Clarence Elquist. He says he’s in the cow business to stay and plans to develop more of his range.

And H. Vance Agee, rancher and member of the Nevada Soil Conservation Committee, puts things this way: “I’m just getting started on my soil conservation program. Right now, I am fencing my range allotment and improving stream channels to get rid of surplus water. I’ve got to do these things and other conservation work to make things pay.”



# Rejuvenation of a Citrus Orchard

By W. Gayle Diamond

This is how a citrus grove in Pasco County, Florida, looked when it was purchased by J. W. Boulware. The young trees on a periodically wet soil had suffered from "wet feet"—all were stunted and many were dead. Boulware asked the Pasco Soil Conservation District for a drainage plan whereby the orchard might be rejuvenated.

A combination ditching and bedding plan was decided on by Mr. Boulware and SCS technicians. The good trees were removed to another location and the remainder destroyed. An angle-blade bulldozer formed the beds and furrows by pushing dirt from the furrows onto the beds and then leveling the beds. The beds were made 50 feet wide and 2 feet above the bottoms of intervening furrows.



Two rows of young citrus trees were planted on each bed. Water drains quickly from the beds into the furrows and on to the outlet ditches at the edges of the field. Pipes at the ends of the furrows prevent erosion that might occur if the furrows emptied directly into the outlet ditches. A cover crop of hairy indigo protects the beds and furrows from erosion and silting.



Outlet ditches along two sides of the rejuvenated orchard carry excess water to a main drainage ditch and help lower the ground water table for the orchard. The young trees are thriving.

Note.—The author and photographer for this picture story is work unit conservationist, Soil Conservation Service, Dade City, Fla. This sequence of pictures won first place in Statewide competition among SCS employees of Florida for the best photographic essay.



*Marginal land made profitable by*

# Group Action on Sage Creek

By John Noyes

FARMERS of the Sage Creek area in southwest Idaho knew that much of their land was considered marginal. They realized that their land had a high water table. Some contended that proper drainage would lower the water table so they could grow any of the crops suited to the valley. But the very mention of drainage made some of the farmers panicky. "Drainage is out of the question—the cost would break us," several argued. "Why should we install unsightly ditches on our land to help drain the farms of our neighbors," others contended. The big question in the minds of most of the farmers was how a drainage problem of such magnitude could be financed.

This was the situation in February 1957 when W. E. Pickerel, a successful farmer and cattle feeder,

Note:—The author is work unit conservationist, Soil Conservation Service, Marsing, Idaho.

called the farmers of the Sage Creek area together to discuss the pros and cons of their drainage problem.

Reports revealed that 25 farmers in the area had around 2,000 acres of land in need of drainage. "Why should our good fertile land be considered marginal just because it is wet?" asked LeGrand Leavitt, an industrious farmer and respected community leader. "Let's do something about our problem," he urged.

The result was that the Sage Creek Drainage Committee was organized with Leavitt as chairman; Alfred Curtis, a farmer-rancher, as vice-chairman; and Pickerel as secretary-treasurer.

The newly-organized group was keenly aware of the responsibility faced in launching the drainage project, and knew that technical assistance would be needed. The

committee took the problem to the board of supervisors of the Owyhee Soil Conservation District at Marsing, and Soil Conservation Service technicians working with the district were assigned to help with the project.

The SCS technicians started work on a complete soil survey of the area, and an underground water topography map showing soil types and elevations of the underlying water table. The Gem Irrigation Company assisted by drilling the test holes. The complete investigation extended over two irrigation seasons.

I then met with the district supervisors, the Sage Creek Drainage Committee, and other farmers to plan the drainage project. After considerable deliberation, they agreed that a substantial portion of the drainage job would be done each year until the project was completed. This reasoning "eased the pain," but the project still had to be paid for regardless of time involved.

"We can solve this drainage problem if we all contribute financially, and use our own labor," they agreed.

A working agreement was drawn up between the Gem Irrigation Company and the Sage Creek Drainage Committee in February 1957.

"The first thing that needs to be done is to clean out the Sage Creek channel and other outlet drains so



Farmers of the Sage Creek area inspect irrigation and drainage practices of nearby areas.

we can get rid of the waste water," declared Forrest Thompson, manager of the irrigation company. SCS technicians designed the water disposal systems with adequate spill and drop structures, and work got underway in March 1957. The farmers contributed their labor in staking the drain ditches and assisted in making the survey.

As the drainage work got underway, the farmers started planning their conservation programs with the assistance of SCS technicians.

In the spring of 1957, Owyhee County Agent Ralph Samson and I met with the Sage Creek Drainage Committee to discuss land treatment practices to be followed as drainage work was completed. Samson suggested that a tour be held to permit farmers to visit farms where drainage had been completed, and to inspect improved irrigation practices and reorganized systems.

The tour included a stop at the farm of Allen and Pete George to inspect a tall wheatgrass planting on salty land. The Georges were county and divisional Grassmen of the Year winners in 1957. The brothers explained that after their land had been leveled, they installed 12-foot border dikes and flushed the salt out of the soil. Then tall wheatgrass was sowed at the rate of 10 pounds per acre with a fertilizer spreader and worked into the soil with a spike-toothed harrow. They had reclaimed 20 acres by this method.

The brothers reported that as soon as a good stand is obtained and the soils show signs of improvement, the grass is plowed under and improved grasses and legumes are seeded. On 13 acres of their improved grass-legume pasture the production was 7,116 cow-days with an income of \$3,900.70 above feed

costs during the pasture season.

The enlargement of two miles of existing drains and the Sage Creek channel were completed in October 1958. Then two miles of open drains and 1,770 feet of tile drain were completed in December 1958. A continual flow of 20 miner inches of water is estimated in the 1,770 feet of 8-inch drain tile.

Some of the farmers plan to install tile drains on their farms. H. C. Albrecht says, "I'll install tile drains throughout my place. The land I'll save by not having to use a huge open drainage ditch will more than offset the cost of installing tile drains, the way land prices are these days."

Leavitt, chairman of the Sage Creek drainage project, said the group aims to complete the drainage project by 1960. Then it will be a maintenance job to keep the open drains in operation. Periodic tests will be made to determine the effectiveness of the drains installed. On-site assistance will be given by the SCS and county agents to the

farmers in reclaiming and managing the land after drainage.

In gathering information on which to base conservation farm plans, conservationists learned that Sage Creek was a natural site for alfalfa seed production.

The alkali bee, which pollinates the alfalfa bloom, is of major importance in profitable seed production. A characteristic of the alkali bee is that he nests in most alkali soils. Therefore, considerable care had to be used in locating the drains in order not to disturb the alkali bee nests.

Since the drainage program was begun, Sage Creek has become one of the outstanding alfalfa seed-producing areas in the country. Fifteen bushels of clean alfalfa seed per acre is not uncommon. In addition to the seed, 11½ tons of hay per acre is harvested, and alfalfa chaff is used for roughage and bedding. From an economic standpoint, row-crop land has no advantage over the land in the Sage Creek project.



Sage Creek drainage channel is inspected by a group of farmers after enlargement work was completed.



# 18 Years of Conservation Planning

By Charles Bisbee

CARL KUMMER has a sound and permanent conservation program on his 800-acre farm near Waterville, Wash., mainly because he has developed it gradually over a period of 18 years. And he is still planning further improvements.

Kummer got his degree in agriculture from Washington State College in 1937, and worked as a field representative of the Agricultural Conservation Program for 4 years before he became an active farmer.

In 1941 Carl took over the operation of his present holdings. Production from the farm was above average for Douglas County at that time, but there were some serious erosion problems. Nearly all fields had been in continuous wheat-fal-

low for years and many new gullies were developing.

In 1942, Kummer became a co-operator with the Douglas Soil Conservation District and started developing the conservation program he is still working on.

One of the most necessary practices Kummer uses is stubble mulching. He has applied this to all of his land, and now has two complete sets of tillage implements. Sweeps and chisels are used most of the time, with a disk outfit for use when heavy stubble needs to be cut.

In 1942, a sandy field near the farmstead was seeded to alfalfa and grass—partly to maintain milk cows and partly to protect this area from wind erosion.

In 1949, a diversion was constructed along the west side of one field for protection against runoff from an adjoining farm. Carl built

another diversion in 1956 in a field near the farmstead, to divert runoff from this field into an area of established grass.

In 1950, Kummer built a rock-wire revetment on the curve of the main waterway through his place and planted the banks to reed canarygrass. This revetment was damaged severely by exceptionally high water the next year. In the meantime Carl had acquired a bulldozer, so this channel was reshaped. He set up a temporary sprinkler system and was able to establish a good growth of grass which provided satisfactory protection.

Kummer has seeded several field gullies to alfalfa and grass after they had been properly shaped and packed. A couple of these are still in use, but most of them have been eliminated as being no longer necessary since most runoff and ero-

Note:—The author is work unit conservationist, Soil Conservation Service, Waterville, Wash.



Carl Kummer (left) and Charles Bisbee discuss the tillage program in a stubble-mulched field on the Kummer farm.



sion are now controlled before reaching these waterways.

In 1951, Kummer was one of five farmers who traveled into southern Idaho to observe the strip-cropping established in that area. Four of these farmers, including Carl, started contour stripcropping in 1952. The following year, Kummer established his second field and each succeeding year added another until every field of his farm now is operated by this system. Besides the other advantages of strips, this has served to eliminate several field gullies.

Partly because of the effectiveness of his strips, Carl has been instrumental in helping to establish this practice on his neighbors' lands. He and the other pioneers in this work now have the satisfaction of seeing 18 cooperators of the Douglas district with stripcropped fields.

One conservation recommendation, which receives considerable lip service but too little application, has been the use of grass as a rotation crop for soil improvement. The early history of Douglas County, as well as experimental information, shows that this is a necessary part of a permanent agriculture for this area.

In 1956, when Kummer started field seedings of grass in a rotation system, he was one of only six operators in the county to have this practice on his farm.

In line with the rotation idea, Carl has made seedings for the past 3 years and plans to make others.

Despite the application of these many practices, Kummer is dissatisfied because some water is still escaping from his land. He consulted with the SCS conservationist and the district supervisors, and they agreed that some water could



Contour strips of stubble mulch hold snow on the Kummer farm.

be saved and a measure of flood control achieved by building small detention dams in strategic locations.

In 1954, Carl built an earth-filled structure adjacent to the graveled road bordering his ranch. This was installed with an 18-inch drop-inlet to serve a twofold purpose. First, it retains a permanent pool which soaks away at that point; and second, it has a flood-control pool 3 feet deep above the regular depth

which is drained by the 18-inch outlet. After watching the successful operation of this unit during two periods of spring runoff, Kummer has installed three more units in other fields.

In small draws in the fields, Carl has built 14 small fills which he hopes will hold the accumulated water on the fields. The idea is experimental and observations will determine whether it should be extended further.



Pond and flood-detention dam with 18-inch outlet on the Kummer farm.



# Vertical Expansion Through Conservation Planning

By Bill Hensley

**I**N 1948 Albert Tibbe bought a 120-acre farm in Brown County, Ohio. It was so badly run down from years of hard farming and the yields were so low that he realized something had to be done.

Tibbe recognized that the 120 acres were not producing enough to support him and his family. As he saw it, he had three choices: (1) to take a part-time job in industry, (2) to increase his farm acreage, or (3) to make the 120 acres produce a higher net income. He chose the latter course, and set out to improve the land and its productive capacity. He calls it vertical expansion.

In the spring of 1949 Tibbe contacted the Brown County Soil Con-

Note:—The author is work unit conservationist, Soil Conservation Service, Georgetown, Ohio.



Albert Tibbe (right) and SCS technician inspect a broad-base terrace and contour planted corn in a formerly gullied field.

servation District and soon had signed an agreement with it. The district gave him priority for technical help from the SCS technicians serving the district.

When the soil survey and land capability map of the farm had

been completed, Tibbe worked with the SCS technicians in making a conservation plan for the farm. The plan included grass waterways, terraces, contour tillage, drainage, and a conservation rotation that called for improved varieties of grasses and legumes on the cultivated fields.

A farm pond was designed, built, and stocked with fish. Multiflora rose hedges were planted around the pond and in other places Tibbe wished to protect from livestock and maintain for wildlife cover. Tibbe does not mow his fence rows and ditch banks until after small grain is harvested so the wildlife will have escape cover during mowing and baling operations.

The woodland had possibilities, and Tibbe put the winter months to good use. He built fences to keep the livestock out and cut and removed dead, defective, and mature trees. He used the sound lum-



Grass waterways on the Tibbe farm where formerly the gullies were deep enough to hide a tractor.



ber thus harvested to build and repair the farm buildings. He has increased his lumber output to almost twice that under previous management.

Former yields on this farm were about 35 bushels of corn and 15 bushels of wheat per acre, but Tibbe now produces an average of 80 bushels of corn, 25 bushels of wheat, and 2½ tons of hay per year for each acre cropped. With lush, well-cared-for pasture, each acre is producing adequate grass and legumes for a unit of livestock.

His farm now carries 6 dairy cows, 30 beef cows, 4 brood sows, and 65 pigs to market size. He keeps about 300 chickens for egg and meat production.

The soil loss on this farm has been reduced from 10 tons to less than 1 ton per acre per year.

The Tibbe farm is typical of many farms in this area where corn production has increased from an average of 35 bushels in 1945 to 56 bushels per acre in 1957. Yields of other grain, hay, and pasture crops have shown similar increases during this period. Most of these increased yields have stemmed directly or indirectly from the conservation farming practices now in use. More lime and fertilizer, better grasses and legumes, conservation rotations, stripcropping, terraces, grassed waterways, and other soil- and water-conserving practices have helped make this vertical expansion possible for these farms. It has meant an agricultural revolution for the area.

With the increasing crop yields and decreasing soil and water losses has come a higher standard of living for Tibbe and his neighbors who are following similar conservation plans. Most farmers of the area are no longer looking for part-time or full-time jobs in the industrial centers of the State.

# A Farm With No Plowland

By Leon J. Sisk

APPLE Valley Farm, nestling in the shadow of Mt. Mitchell, in western North Carolina, is sometimes called "The Farm Without A Plow."

"I could probably find several plows if I looked hard enough for them," says Robert Phillips, owner of the farm, "but they are very seldom used. Except for a vegetable garden there's very little plowed land on Apple Valley Farm. A plowed field is an engraved invitation to the soil to wash away."

It's Phillips' theory that wherever there is bare, plowed land there's bound to be soil lost at some time or other.

"One year out of every two or three there'll be enough rain for it to wash badly," he says. "That's why I don't stripcrop. Stripcropping is better than plowing a field solid, but a farmer can't plow the cultivated strips narrow enough not

to lose some soil if it rains hard enough or long enough."

There's no bare land on Apple Valley Farm. Trees are growing on land too rough to graze. Where Phillips can use a tractor and baler he's growing alfalfa. He puts grass on the "in-between" land where it's difficult to harvest hay or silage, and leaves it there permanently.

Phillips has land that has been in grass for 25 years. "With proper fertilization and rotation grazing, grass can be grown year after year in this part of the State," he says. "All it needs is lime and phosphate, and the regular use of a mowing machine to keep down weeds."

A grass-and-clover mixture is sown in the apple orchard strictly for soil protection. Phillips never takes hay off his orchard land. He cuts it three times a year but leaves it on the land as mulch.

He says that he has never had any noticeable decrease in the apple crop because of dry weather.

Note:—The author is information specialist, Soil Conservation Service, Spartanburg, S. C.



The apple trees are less than 2 years old but the grass cover crop is 25 years old on this sloping field of Apple Valley Farm. Only small areas of grass were disturbed when the young trees were planted.



"The grass-clover mulch is the reason," he points out. "Practically every bit of the rainfall is taken up by the soil, and with a thick layer of grass mulch on the ground, very little moisture is lost from evaporation."

There is a soil and water conservation plan for Phillips' farm, which he follows carefully, developed by him and Ray Bryant, SCS technician in the Mitchell County Soil Conservation District. Although Phillips has been a conservation farmer all his life, he has established several practices since the plan was prepared, including grass waterways, multiflora rose fences, reestablishment of conventional fences on the contour, mulch farming, pasture improvement, and reforestation.

The farm has been designated as a "Tree Farm" under the North Carolina Tree Farms System because of Phillips' forward efforts in reforestation and woodland management.

In addition to the many conservation practices which he has es-

tablished on his own farm, Phillips has had widespread influence in the spread of soil and water conservation in Mitchell County.

Phillips was a school principal for 25 years and then a county school superintendent, but at heart he has always been a farmer. While a school principal he also taught vocational agriculture. He was a part-time farmer all through his career as an educator but has devoted full time to it for only the last few years.

He specializes in growing apples, and his secondary crop is livestock which he "sort of has to keep" to consume all the grass and hay which

he plants primarily as soil cover.

Indicative of his feelings for the soil and soil protection is a dream which recurs quite often to Phillips. In the dream Phillips' farm has washed away and has been replaced by eroded, bare, gullied fields.

"It's more of a nightmare than an ordinary dream," Phillips says, "but I don't mind dreaming it at all because it's such a good feeling to awake and realize that it was just a dream and that the land will be there when morning comes and for all time so long as the conservation practices which I have established are maintained and continued."



## A Stemwinder on Dry Creek

IN western Nebraska, six-foot-four, 200-pound Ira Flanagin is considered a good man to have on your side. He's what they call a "stemwinder" in this section of the country.

For the past 30 years Flanagin has been an ardent advocate of soil and water conservation. More recently, he has been a watershed protection man and has faced the challenge of Dry Creek.

Against this "bad actor" he has pitted the same unstoppable optimism he uses to see every job through. And the Dry Creek Pilot project is nearing that point. Land treatment is over 80 percent done—and the 12 major structures built at a cost of \$380,000 have been completed.

Flanagin has not neglected his 800-acre wheat, feed, and dairy farm either. But if you review

what he has done elsewhere in the community north of Bartley in the past few years you could easily expect he might have had to.

Flanagin has continued his lifelong upgrading of equipment, livestock, and conservation at home while heading the drive to make Dry Creek one of the West's best watershed examples.

On the heels of a communitywide information program used to speed an understanding of the Dry Creek plan among his 328 neighbors, Ira went to work on easements. Before long the sponsors had 40 easements in their pockets and Flanagin had become a notary public in the process.

"Didn't figure it was right to start scurrying around for a notary after a man had decided to sign," Flanagin explained.

When contractors balked at the



Robert and Mrs. Phillips on the lawn of Apple Valley Farm.



**Ira Flanagin**

prospect of seeding and mulching the slopes of the first three main structures, Flanagin and his supervisor-neighbor, Lloyd Riddle, teamed up to seed and cover-crop the dams.

Flanagin has lived that way all his life. A full-time farmer at 20, he was one of the first 10 cooperators of the Red Willow Soil and Water Conservation District. He built the first terraces and was one of the first to use bench leveling. He contours everything. He is a stickler for stubble mulching, pasture seeding, proper use of grassland, and for good livestock. He has devoted himself to the land, to the crops, and to the livestock to shape his place into a topnotch family farm.

Flanagin was born less than a mile from where he and his wife now live. But his influence is Plains-wide. He has been a supervisor and chairman of his district and, more recently, area director of the State association of districts.

Visitors to the Dry Creek watershed project can well use it to pilot the way in their home communities. If they follow the pattern of leadership Ira Flanagin and his neighbors have shown, success for them will be just around the corner.

—BY HERBERT I. JONES

## Does it pay to prepare fine seedbeds?

Corn and small grain planted in coarse seedbeds yielded almost as well as when planted in finely worked seedbeds, and erosion was much less, according to recent experiments at the Conservation Experiment Station, La Crosse, Wis.

Corn planted on land prepared by normal procedures (spring-plowed and worked several times) averaged about 92 bushels per acre during the 4 years of tests. Planted by the wheel-track method (plowed only), the average yield was 82 bushels per acre. More than 1.75 tons of soil per acre was lost by erosion from the conventional corn seedbed on the average, while less than .5 tons was lost from the wheel-track planting. Runoff losses followed the same trend.

The results were much the same for oats. A conventional seedbed (fall-plowed, then field-cultivated in the spring) yielded about 92 bushels of oats per acre and lost almost 5 tons of soil per acre on the average during 2 years of tests. Plots prepared by field cultivation in the fall and one cultivation in the spring (with corn stover removed) yielded around 81 bushels per acre and lost 200 pounds of soil per acre. When corn stover was chopped up and cultivated in, yield was around 85 bushels per acre and soil loss was practically nothing.



## Corn for Green Manure

In recent Illinois tests, an early hybrid variety of corn was drilled at the rate of 4 bushels per acre. It produced 300,000 stalks per acre. In early August, the huge crop of stalks and leaves—about 33 tons per acre—was turned under as green manure.



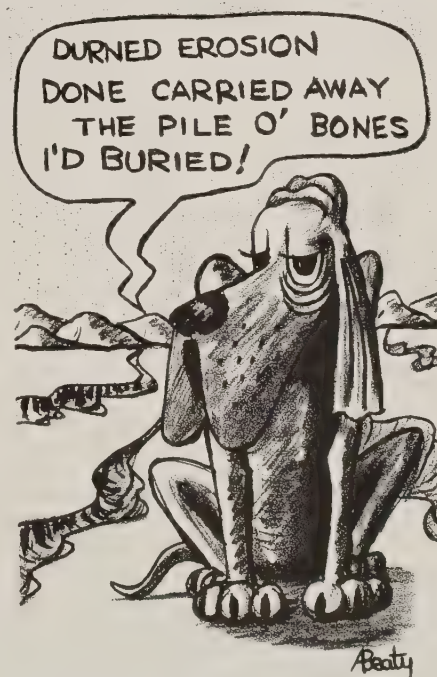
A Georgia lumber company has developed a circular saw with only one-fifth the number of teeth found in conventional saws. The saw produces chips instead of sawdust, when used on normal-sized logs.

## Gypsum for Alkali Correction

Vertical or band application of gypsum to high-sodium soil may provide New Mexico farmers with a cheaper and more efficient method of treating their soils to get better water penetration and root growth, according to laboratory tests at the New Mexico State Experiment Station. Farmers at present broadcast the gypsum over the entire surface of a field, disk it in, and then irrigate to get a chemical reaction in the soil. This method is almost prohibitively expensive on high-sodium soils.

In band application, one band of gypsum is applied to each row at planting time. The effect of the gypsum is concentrated, reclaiming the soil around the plant and permitting deeper water penetration for good root growth. In succeeding years, bands of gypsum can be applied to rows in different locations, eventually reclaiming the entire field.

Dr. Harold E. Dregne, soils professor with the experiment station, believes that with the band method a farmer can reclaim his sodium-affected land in three to four years at less cost with a smaller amount of and more efficient use of gypsum.





CHANGE OF ADDRESS SHOULD INCLUDE ZONE, OLD ADDRESS, AND CODE NUMBER

## International Land Judging Contest

More than 20 States are expected to take part in an international land, pasture, and range judging contest April 28 and 29 in Oklahoma City. Twenty-five representatives from 12 foreign nations have indicated they will participate.

Objective of the event is educational work in soil and water conservation, pasture development, and native grass management.

The six divisions in the contest include adults, 4-H, FFA, women and girls, collegiate, and foreign.

## River pollution study

Nature's own method of fighting river pollution will be the object of a three-year investigation by the University of Michigan School of Public Health. Scientists are planning an intensive "health examination" of two Michigan rivers. From their findings they hope to aid the natural self-purification process. The U.S. Public Health Service has approved a three-year grant to support the study.

The first year will be devoted to a survey of lower Michigan to select two rivers for study. Researchers will choose one river which carries domestic organic waste, and another with industrial organic waste.

More than 96 percent of the farms of the United States now have electricity.

## Better Alfalfa Silage

Alfalfa makes better silage if finely chopped and bruised, according to recent USDA tests. Scientists harvested third-cutting, unwilted alfalfa with a forage harvester. Part of the alfalfa was cut in 3-inch lengths, and the rest in  $\frac{5}{16}$ -inch lengths. The finely cut alfalfa was then run through a flail type harvester.

During the silo storage period, the finely cut, bruised alfalfa proved more acid than the coarse silage. It contained more of the desirable acids and less of the undesirable acids in silage.

The scientists feel that bruising the alfalfa helped fermentation of the silage by rupturing the plant cells, thereby producing fermentation faster and differently from that occurring in coarsely chopped silage.

Prefabricated sheets of burlap coated with asphalt are being tested by the Agricultural Research Service as a practical and long-lasting liner for irrigation canals.

Wooden water pipes estimated to be 120 years old were dug up recently in downtown Chicago and found to be in excellent condition, according to the National Lumber Manufacturers Association.

City engineers said the pipes, made from white pine logs 11 inches in diameter with a four-inch-diameter hole, could still be used for their original purpose.

## FARM EMPLOYMENT DOWN —EFFICIENCY UP.

The Crop Reporting Board estimates that the farm worker force in 1959 averaged about 7.4 million. This is a 2-percent drop from 1958, and the smallest since the series of estimates began in 1910. In the peak year 1916, the number of farm workers was nearly double the 1959 total. But this reduction in workers did not slow down the Nation's farming; greater acreages of cotton and corn were planted and harvested than in 1958, and farm wage rate levels were at a new high—averaging \$0.896 per hour, a jump of nearly 4 percent over the previous year.

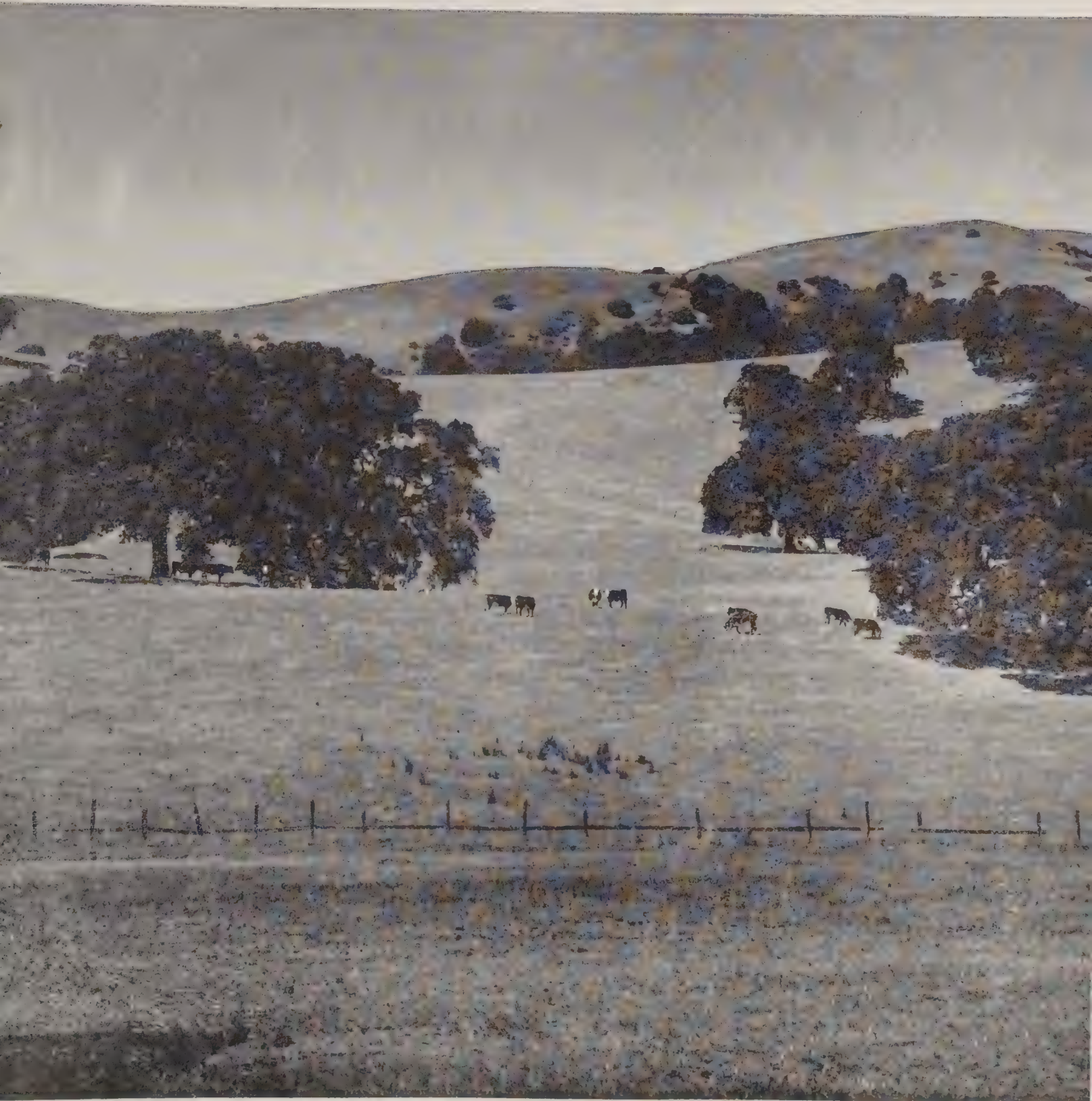
Farm population in the United States declined from 25.1 million in 1950 to 21.2 million in 1959. In 1960 less than 1 person in 8 will live on a farm.

About 40 percent of all jobs in the United States are, directly or indirectly, in agriculture. Of the 65 million people employed, about 25 million are in agriculture—7 million work on farms, 7 million produce for or service farmers, and 11 million process and distribute farm products.

Japan's birth rate fell from 34.3 per 1,000 in 1947 to 18.0 in 1958. This was the most rapid decline in birth rate known to history, according to the Population Reference Bureau.

MAY 1960

# Soil Conservation





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*It were happy if we studied  
nature more in natural things;  
and act according to nature,  
whose rules are few, plain and  
most reasonable.*

—WILLIAM PENN



COVER PICTURE.—A well-managed range in the Contra Costa Soil Conservation District, California.

# Soil Conservation

**EZRA TAFT BENSON**  
Secretary of Agriculture

**DONALD A. WILLIAMS**  
Administrator, Soil Conservation Service

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# Realism for Davey Crockett

in his adventures at the Alamo

By Meril G. Carter

TEXAS' epic battle for independence is the subject of a new John Wayne movie, "The Alamo," to be released in the fall of 1960. The locale for shooting the movie is the rough prairie country along the Rio Grande River in southwest Texas, centering around the old town of Brackettville.

Wayne's insistence on realism in

his movies led to a new alliance between the movie industry and conservationists.

Most of us have been conditioned to viewing vast areas of grassless plains, eroded arroyos, and dust storms in our western movies. Yet, the historical evidence points to abundant grass, clear streams, and herds of wild animals existing in the early days of the Southwest.

The vast amount of research

done by Wayne prior to the filming of the movie convinced him that the true story of the early days of Texas and the "Alamo" took place in a "sea of grass." In searching for a location similar to the vicinity of old San Antonio and the Alamo mission, Wayne chose the 22,000-acre ranch owned by "Happy" Shahan, well-known Angus breeder and conservationist of Kinney County.

Note.—The author is area conservationist, Soil Conservation Service, Uvalde, Tex.



John Wayne and fellow actors portraying Davey Crockett and his Tennesseans as they rode through a "sea of grass" on their way to the Alamo.





**Buster Lindley, SCS technician, in reseeded grass on the Shahan ranch with a replica of the Alamo in the background.**

Exact replicas of the town of San Antonio and the Alamo mission compound, as they were in 1836, were constructed from adobe brick and native stone. Unfortunately, the site of the main battle and cavalry charges was a bare, eroded hillside. Happy Shahan, with technical advice from "Buster" Lindley, SCS technician, succeeded in regreasing the site in time for the movie shots.

But this still didn't solve all of Wayne's problems.

His desire for realism called for a limitless expanse of tall grass as the background for the scenes showing Davy Crockett's first glimpse of Texas as he rode to his destiny at the Alamo. He repeatedly complained about not being able to find a large enough area of tall grass to represent the plains of early Texas.

Fortunately, Wayne mentioned this problem to a neighboring rancher, W. L. (Bill) Moody IV. It just happened that Bill had worked for several years carrying out his conservation plan with the West Nueces-Las Moras Soil Conservation District. This plan called for restoration of his ranch from a wilderness of thorny brush and



**SCS technicians inspect brush and weeds on the Tequesquite Ranch before clearing and seeding operations.**



**Bill Moody (center) and neighbors in reseeded range on the Tequesquite Ranch where scrub brush, weeds, and cactus were the principal plants a few years ago.**

cactus to its former pristine condition of lush grasses grazed by cattle and deer.

Bill Moody prevailed on Wayne to look at his ranch. One look at Moody's Tequesquite Ranch convinced Wayne that his search was over.

Buster Lindley helped cinch the decision when he remarked to Wayne and his head cameraman that he "was waiting to see an historical movie of the Southwest showing beautiful plains of grass as they actually existed, rather than a bare, eroded landscape."

The grass on Moody's ranch did not come about overnight or by accident. Moody began his long-range conservation program in 1952, when he started managing his own ranch and 125,000 acres of land for the Moody Foundation. When the West Nueces-Las Moras Soil Conservation District was organized in 1955, Moody soon developed and began carrying out a plan based on the needs of the soils and vegetation. His longtime goal is to have every acre of land pro-



duce as it did in its original condition. Among the measures called for in his plan are brush eradication followed by reseeding and deferred grazing.

Once the grass is re-established, he uses the grass moderately to promote growth and vigor. He has constructed ponds so that the livestock can graze the grass more uniformly. Wildlife has benefited greatly from the increased growth of grass and from small areas of brush left for their protection. Since 1956 Bill has completely restored 9,000 acres of depleted rangeland by brush control and reseeding. The entire ranch is being improved by deferred grazing and proper use.

Ranchers throughout southwest Texas are looking forward to seeing "The Alamo" with its scenes of



Meril G. Carter, SCS technician, views reseeded grass on the Shahan ranch with the replica of old San Antonio in the background.

pioneer Texas and the "sea of grass." And "The Alamo" may set a precedent for realism in movies of the Southwest. Perhaps herds of cattle and charging horsemen

will no longer be set in a scene of grassless desolation, where neither man nor animal could exist, but in a natural environment of life-giving grass and clear streams.

**Striving for efficient beef production—**

## Conservation Range Management

*was the answer for a New Mexico rancher*

By Herbert I. Jones and L. J. Walpole

**T**HE principal target for rancher J. C. Neafus has always been the most efficient beef production he could get. In striving for this goal, he has accomplished something else—one of the best examples of conservation range management you'll find anywhere in the Southwest Plains.

Neafus runs a 40-section spread near Newkirk, New Mexico, that is noted for its topflight Hereford herd sires.

Here is a box score of some of his conservation accomplishments:

Note:—The authors are, respectively, information specialist, Denver, Colo., and work unit conservationist, Santa Rosa, N. Mex., both of the Soil Conservation Service.

1,000 dams and diversion dikes built; adoption of specific grass management for every pasture; Pinon-Juniper clearing of 1,200 acres; complete gully control on two major drainages; 2,000 acres of waterspreading for hay production; contour furrowing of several thousand acres of "tight" land; and seeding of all abandoned cropland and reseeding of rangeland "spots."

In the process, Neafus has integrated 100 separate tracts, many of them plow lands, to form the balanced ranch unit he now operates. Gradually, over a period of 25 years, he has worked each prop-

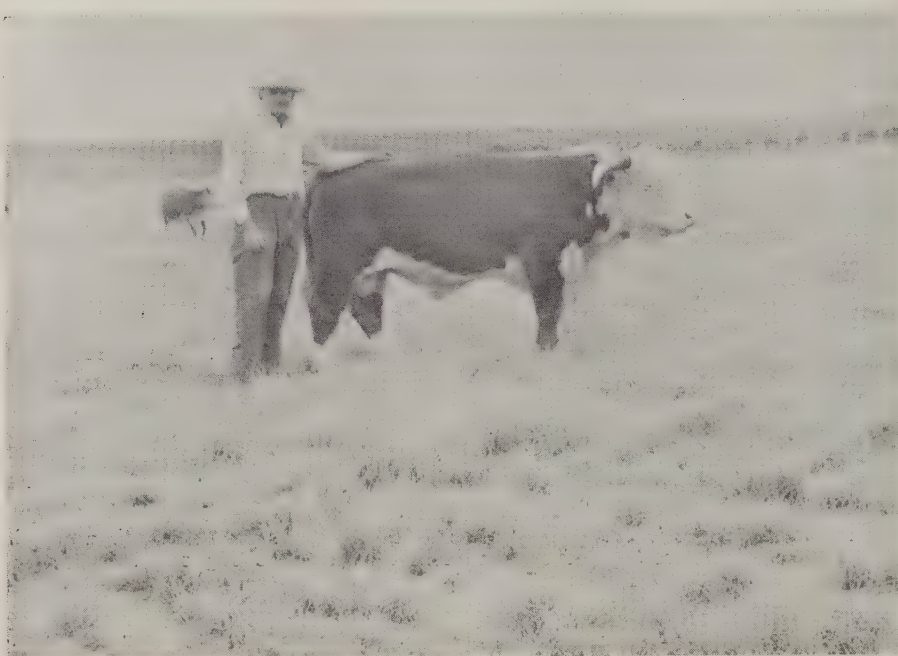
erty into his scheme as he has the 8,000 acres of range he leases.

Neafus often remarks that he wouldn't have had the courage to tackle all the tracts at one time. It's a good thing for conservation and for the community that he was able to work man-sized pieces.

Current ranch plans call for additional waterspreading, reseeding, and brush eradication—vertical expansion.

Cliff Neafus' story won't end with anything short of A-1 production efficiency—but it didn't begin that way. Cliff came to the northeast New Mexico territory as a boy when his father homesteaded





J. C. Neafus and one of his herd bulls in a well-managed blue grama pasture.

160 acres in 1901. There were paying crops in some of the early farming years, but more often there were none. Cliff's first years were marked by the loss of neighbors and friends who moved away as they were gradually convinced that it was rangeland after all. The few families who stayed learned that ranching could provide a good life. The land asked in return work and management—above all, management.

Cliff Neafus is the kind of man who is both a manager and a worker. He is spending a lifetime helping nature correct the mistakes of forgotten settlers. Grass is his healing potion—water control makes the grass grow.

Neafus feels there can be no substitute for range feed, that good grass management coupled with practices that make the best use of rainfall is the key to a successful livestock operation. How well his beliefs have paid off is shown by the 500-pound range calves he markets each fall, by his replacement heifer herd, and by the 75 selected bull

calves he readies for service each year.

Neafus pioneered many of the conservation practices that he and most ranchers take for granted today. Some of the first erosion-control waterspreading dams to be

built in the West were built by Cliff Neafus more than 25 years ago.

As a result of his early interest and work Neafus became a "booster" for the conservation way of soil, water, and grass management.

Currently, Neafus is operating with a Great Plains Conservation Program plan which is a refinement of his longstanding ranch plans with the Guadalupe Soil Conservation District. He has participated in the Agricultural Conservation Program for many years and was one of the county's original ACP committeemen.

Area Conservationist Herb Cavett terms Cliff's work one of the top development jobs in the region. Cliff scoffs at that compliment when he is asked about it, but adds that he would welcome any rancher to his place to swap ideas.

If you take up Neafus' offer you may see him working cattle and perhaps shaping up the top half of his registered bull calves. You



A gully on the Neafus ranch from which runoff water has been diverted while grass heals the erosion scars.





Lush grass in an area where one of Neafus' waterspreading structures empties runoff from a nearby ridge.

may see native grass seed harvesting, haying, or perhaps some planting or dirt work—depending on the season.

No matter when you visit the ranch, the waterspreading systems Neafus has built over the past 25 years will catch your eye.

All over the ranch are hundreds of dams, diversions, dikes, and ditches built with the idea of spreading channeled runoff. The result: 2,000 acres get extra water and 1,000 tons or more of native hay is laid by—just in case. So lush is the hay crop that Neafus finds it more convenient to let a neighbor have half the crop just to put up his share than to bother with his own equipment. Even so, there is a lot left standing. Neafus uses the hay and only a small amount of cottonseed cake to condition his stock and to carry them through the winter.

That his grass management has done its job, conservation-wise, can best be pointed out by examining the few remaining gully cuts that were once the pattern of the land rather than the exception.

Neafus points out that his conservation practices, including the waterspreading, have cost him around \$30,000, with cost-sharing from the Federal Government nearly matching this amount. Spread

over 25 years, it has meant an annual cost per acre of around 12 cents—little enough, he adds, compared to the grass reward.

Two of the most expensive jobs Neafus has done are spot-hay mulching and chain brush control. The former is running as high as \$25 per acre as Neafus seeks to “hair-over” pocks of the six-year drought.

The Pinon-Juniper removal work done with a local contractor's heavy crawlers and a 600-foot anchor chain has brought a 90-percent kill of the scrub trees, and seedlings of blue and sideoats grama have already popped up following the hand seeding of last spring.

The lengths to which Neafus will go to produce range grass are pointed up wherever you go on the 28,000-acre spread. And, nothing delights Cliff Neafus and his wife Claire more than to show their handiwork to visitors.

Whether that visit is for an hour or a whole day, whether you see one or many of the ranch's interesting facets, you'll come away with Cliff Neafus' words indelibly etched on your mind: “To the cattleman, there is no substitute for range feed—and soil, water, and grass management will get you that feed.”

## Nematode control in soybeans

Crop rotation seems to be the most practical method now known for controlling the spread of soybean cyst nematodes in Illinois, according to M. P. Britton, plant pathologist at the University of Illinois. He explains that most crops commonly grown in Corn Belt rotations are resistant to the nematodes. Hence, if such crops as corn, small grains, and hay are grown in rotation with soybeans the nematode damage should be greatly reduced. Experimental work is now underway to determine the best rotations to use against the nematodes.

The nematode, which can cause severe losses in soybeans, has a stronghold in Tennessee, Missouri, Arkansas, and other nearby States. Indications are that it's marching northward. It turned up in the southern tip of Illinois late last summer.

The cyst nematode spreads with bewildering ease. The eggs are well protected within cysts that can be carried by farm implements, tools, shoes, boxes, crates—almost anything that touches an infected soil. Wind, runoff water, and wildlife are also carriers.

Britton said that controlling spread of the nematode depends on recognizing symptoms of its presence in soybeans. Although positive identification isn't easy, he said farmers should watch for stunted plants. In soils of low fertility these plants may turn yellow. The infection shows up in patches in which all plants are affected. Stunting and yellowing from water damage look very much like nematode injury.

Weed control in the rotation program will also be important. Several weeds are known nematode hosts and definitely contribute to its spread.

Soil fumigation has proved too expensive so far but is still being studied in heavily infested areas.



Farm stocks of feed grains on January 1 were six percent higher than the 1959 record.



# An Important 25th Anniversary

By D. A. Williams

ON April 27, 1935, Public Law No. 46 of the 74th Congress was signed by the President. This law declared soil and water conservation on farm, grazing, and forest lands to be a permanent policy of Congress and directed the Secretary of Agriculture to establish a permanent agency in the Department of Agriculture to carry out the purpose of the act. The Secretary of Agriculture named that agency "The Soil Conservation Service." Hence, April 27, 1960, may rightfully be called the "Silver Anniversary" of the Soil Conservation Service.

Soil conservation experiment stations had been started at various locations over the country in 1929, as a result of congressional action that year. The Soil Erosion Service was created as an emergency agency in the Department of the Interior in September 1933 and transferred to the Department of Agriculture in March 1935. These preliminary steps set the stage; but not until the enactment of Public 46 was a national policy declared and the SCS born.

At the time the Soil Conservation Service was created, erosion control demonstration areas were already underway in a number of small watersheds and problem areas as a part of the program of the Soil Erosion Service. Soon thereafter a large number of CCC camps were transferred to SCS for technical administration, and many other demonstration areas were created.

In 1937 many of the States passed laws permitting the creation of local soil conservation districts: in ensuing years, all States passed such laws. Since that time the Soil Conservation Service has carried out its designated objectives mainly by working with these locally governed soil conservation districts.

Since 1935 SCS has administered or helped administer several related programs aimed at better land use and soil and water conservation. Some of the more significant programs in which the Service has participated are: The flood prevention program, authorized by the Omnibus Food Control Act of 1936, with later amendments; the water facilities program, authorized by the Pope-Jones Act of 1937; the land utilization program, authorized by the Bankhead-Jones Farm Tenant Act of 1937; the shelterbelt program for the Great Plains, authorized by the Norris-Doxey Act of 1937; the small watershed protection program, as authorized by the Watershed Protection and Flood Prevention Act of 1954; and the Great Plains Conservation Program, as authorized by Public Law 1021, in 1956. Yet, the basic authority for most of the conservation work the Service has been and still is doing is Public 46.

Emphasis on different phases of the overall program has varied from time to time as public opinion or Congressional authorization pointed up specific needs. Conservation techniques have improved greatly over the years. There have

been many changes in the personnel of the Service during this time. There have been several reorganizations of Service administration. Yet, there has been a surprising continuity in the program as a whole.

Many of those who were on the original staff are still with the Service. Only three men have served as chief administrators of SCS during the 25-year period: Hugh H. Bennett, Robert M. Salter, and myself. More important is the fact that the Service's basic objectives have undergone little change and the initial concepts on which the program was originally based are still valid. The concept that land varies from field to field and that it can be classified as to its capability and needs and so used and treated is still valid and is a basic premise on which all Service programs rest. The idea of treating entire farms and entire watersheds as units is still valid. The assumption that soil conservation and water conservation are inseparable phases of one program still holds. These and other basic principles were the foundation stones of the early programs of the Service and still serve as such.

In the next 25 years, techniques may change or be improved. Personnel will change. New problems, new needs, and new programs will develop. But, the basic objectives and the basic concepts will still add up to better use of land and water for better living for everyone. They probably will stand the further tests of time.

Note:—The author is Administrator, Soil Conservation Service, Washington, D. C.

# Reshaping a Farm

By Neal S. Bue



Hugh H. Bennett, 1935-51



Robert M. Salter, 1951-53



Donald A. Williams, 1953-

**E**ARTH moved by the Meyers Brothers Livestock Company in Idaho's Yellowstone Soil Conservation District during landshaping operations on their 480-acre livestock farm would make a pile one acre square and 90 feet high.

That would be equivalent to a 4-story building on a city square block. But that is only part of the story. With livestock, well-planned rotations, and smart management the Meyers brothers have made an outstanding success of building a productive farm out of what was once considered marginal land.

The land shaping program has been dependent on a stock feeding program. As Marvin Meyers puts it, "The leveling could not have been carried out without the stock feeding program."

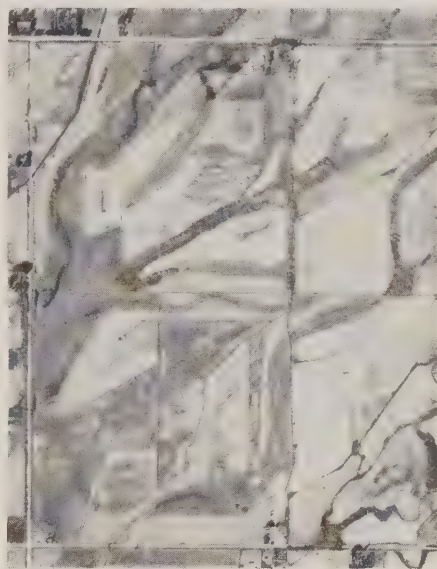
One must look at the aerial photographs taken in 1941 and again in 1951 to see the change that has taken place in field pattern.

When Marvin and Wayne bought the place in 1942, it was cut up into 40 or 50 separate small fields with alternate gravelly ridges and swampy low spots that grew only willows and cattails. The brothers knew that their first job was to get the land in physical shape for more efficient irrigation with larger and more uniform fields and less waste areas.

The next step would be to rebuild the soil itself. Because Wayne and Marvin had been brought up just across the road, they knew what the land would need—level-

ing, a crop rotation plan, and a livestock program.

The Yellowstone Soil Conservation District was organized in 1945. The following year, upon request from the Meyers brothers for assistance, SCS technicians working



Aerial photo of the 480-acre Meyers farm: (above) as it looked in 1941, (below) as it looked in 1951.



Note:—The author is work unit conservationist, Soil Conservation Service, St. Anthony, Idaho.





**Land shaping operations on the Meyers farm.**

with the Yellowstone district helped them work out a conservation plan for the farm based on proper land use, crop rotation, fertilizing, and irrigation.

In 1946, with the help of SCS technicians and with cost-sharing provided by the Agricultural Conservation Program, a plan for reshaping the land surface and reorganizing the irrigation system was started. A canal running across one end of the place was relocated along the north and west boundary of the farm. The Meyers brothers also bought their own land

shaping equipment—a crawler tractor and an eight-yard scraper—and started an intensive leveling program.

Because of the gravelly and porous soil, surface irrigation was unsuccessful. Marvin and Wayne changed to sub-irrigation, which is particularly suitable in their area because a layer of impervious lava underlying the valley floor keeps the water table high. By properly spacing sub-irrigation ditches it is possible to control the height of the water table.

The brothers have reshaped the

entire farm once and now are going over it for the second time to get a uniform designed grade. Marvin says, "The second time over in leveling really pays, in both irrigation water management and crop production." When the farm is shaped for the second time they will have moved somewhere between 800 and 1,000 cubic yards per acre.

They have found that in heavy fills a layer of coarse sand and gravel should be placed at the bottom of a fill. This helps to prevent restriction of the upward movement of the sub-irrigation water.



**Marvin (left) and Wayne Meyers with one of their livestock feeding pens in the background.**



**Cattle feeding pens on the Meyers farm.**

After a field has been shaped, it is subsoiled to a depth of about 18 inches and then is used as a feed lot. The brothers feed about 2,500 cattle and 15,000 lambs each winter. The feeding pens are about 200 by 250 feet in size and constructed in movable sections. Each pen has its own feed bunks and water troughs on skids. About 1,000 lambs or 125 to 150 steers are placed in each pen. The pens are moved about every 10 days. An obvious advantage of this system is

that the lambs and steers spread the manure quite evenly. Two men can handle 7,000 to 8,000 lambs or 800 to 1,000 steers at a time by this feeding method.

The rest of the fertilizing program and the crop rotation is then carried out. The fertilizing program consists of the application of 30 tons of manure per acre from their feeding program every other year. Approximately 200 pounds of 33-percent commercial nitrogen per acre is applied on wheat and

corn. Phosphate is used on alfalfa, and a mixture of nitrogen and phosphate on the pastures.

The seven-year rotation includes a new hay seeding with small grain, three years in hay followed by wheat, corn for silage, and beets. Then they go back to the hay seeding.

As a result of this land leveling, stock feeding, crop rotation, and fertilizing program, the Meyers' farm now looks like a tabletop. About 125 acres that once were

ditches, wet swales, and dry knolls have been reclaimed for cropland or good pasture.

Crop yields have almost doubled. The usual yields per acre now are 75 bushels of wheat, 25 tons of corn silage, 20 tons of beets, and 4 tons of hay.

Furthermore, irrigation efficiency has been greatly increased. One man can now irrigate the farm efficiently, whereas formerly two or three men could not irrigate all of the farm properly.

# TESTING DEBRIS GUARDS FOR PIPE SPILLWAYS

By W. R. Gwinn and W. O. Ree

**D**ETENTION reservoirs are key structures in the current flood prevention program. Release of the flood waters these structures temporarily impound must be done at predetermined rates so the streams below will not flood. Pipe spillways of proper size and form can automatically hold the release rates to the desired maximums. When floating debris and trash are present in the flow, however, the pipe spillway can become clogged and fail to perform as designed.

The trash problem has been particularly vexing to conservation engineers. With little more than intuition and imagination to guide them SCS engineers have produced a variety of designs for guards to keep the trash from pipe entrances. Some of these guards have worked well, while others have been inadequate. Those that worked have been in some cases unnecessarily complicated and expensive.

To help find the "best" trash guard, studies have begun at the Stillwater Outdoor Hydraulic Laboratory of the Agricultural Research Service in cooperation with the Oklahoma Agricultural Experiment Station. The exploratory tests of the research engineers tell a story of patience, persistence, and ingenuity which should be of interest to conservationists.

Briefly stated, an adequate guard is one that will stop the trash that will not go through the pipe and pass the trash that will. Also, the guard—trash-laden or clean—should not adversely affect the capacity of the pipe spillway, nor should it be unduly complicated in form or too expensive to build. This describes the goal of the experimenter. His next step was to plan a research program to reach his objective.

It was decided to base the research program largely on the testing of small models in an indoor laboratory. This would allow a large

number of types to be tested thoroughly, without the undue waste of water required for outdoor testing of full-scale models.

With clear-water tests, similarity between a model and the prototype was not too difficult to achieve, but when trash was introduced into the flow the similarity was lost. Since the value of the model tests would depend on similarity, special tests were needed to determine the relationship between model trash tests and full-size structure trash tests. So the first tests were made on a full-size pipe spillway with a trash-laden flow.

## No. 54

This is the fifty-fourth of a series of articles to appear from time to time in explanation of the various phases of research being conducted by the Department of Agriculture on problems of soil and water conservation.

Note:—The authors are hydraulic engineers, Agricultural Research Service, Stillwater, Okla.



The spillway used was already available on the hydraulic laboratory grounds. It consisted of a 24-inch concrete pipe through a small earth-fill dam. The square drop-inlet riser was rebuilt to conform with a design then current in the south central States. A trash guard, also patterned on existing designs, was installed on this riser.

A test flow was run into the head pool at the entrance to the pipe spillway. A trash load of 8 pickup-truck loads of lovegrass hay was tossed into the pool. This provided a severe and realistic test. After 22 hours of pipe flow the hay had gathered about the inlet and flow capacity had been reduced to about 50 percent. In other words, the pipe spillway could now discharge at only one-half its capacity

rate because of clogging of the trash rack bars. These tests pointed out immediately the need for a more efficient trash guard. They also provided the data for a comparison of model tests with full-size structure tests.

The model studies were undertaken next. A one-eighth-size model of the drop inlet and trash guard was built of plexiglas and brass. This model was placed in a hydraulic flume, and the testing began.

Lawn clippings introduced into the flow did not behave in the model as the hay did in the full-size structure. The clippings simply floated on the water surface and never clogged the rack bars. It was readily apparent that lawn clippings would not provide a realistic test. Hemp fibers were tried next.

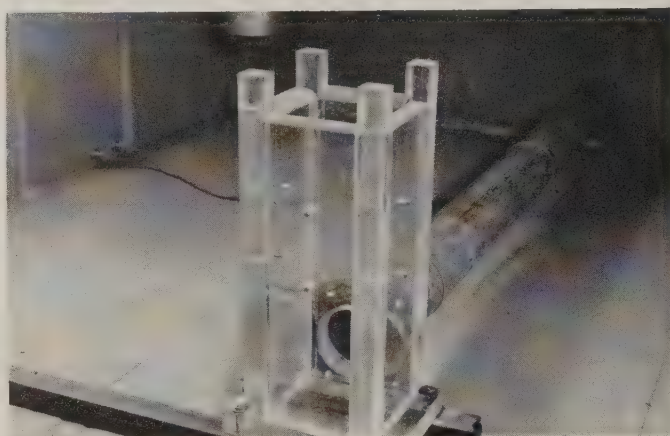
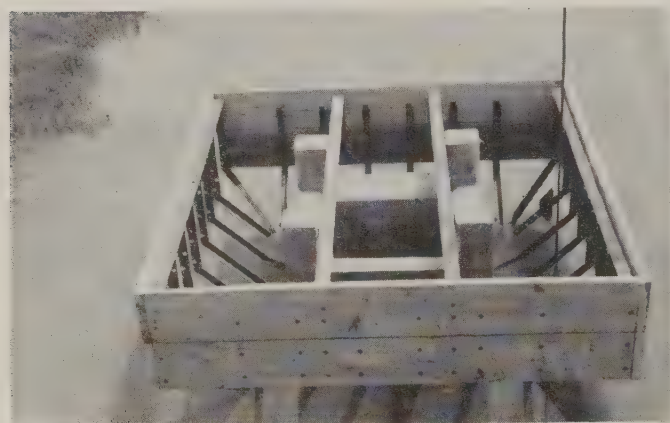
These behaved a little more like hay trash, but not enough. The next step was to treat the hemp fibers with dilute sulphuric acid. This made the fibers more pliant, and more important, more wettable.

After trying several different acid strengths and various durations of soaking in the acid a formula for preparing the hemp fibers was selected. The final recipe called for cutting the fibers into  $1\frac{3}{4}$ -inch lengths, soaking them in a 6-percent acid solution for a 3-minute period, and then rinsing thoroughly in clear water. Trash tests using this type of trash on the model spillway provided the realism desired.

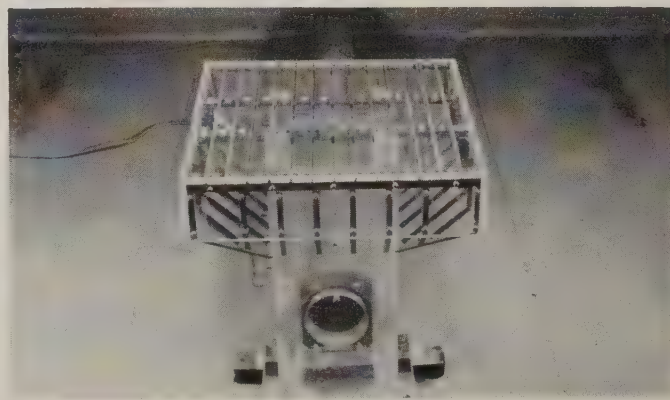
The story is best told by a series of photographs of the model and prototype at four stages of the testing.



The 30-inch square inlet to a pipe spillway through a small earth-fill dam on the hydraulic laboratory grounds at Stillwater, Okla. (above) before the trash guard was installed; (below) the trash guard for the inlet, minus the top deck pieces.



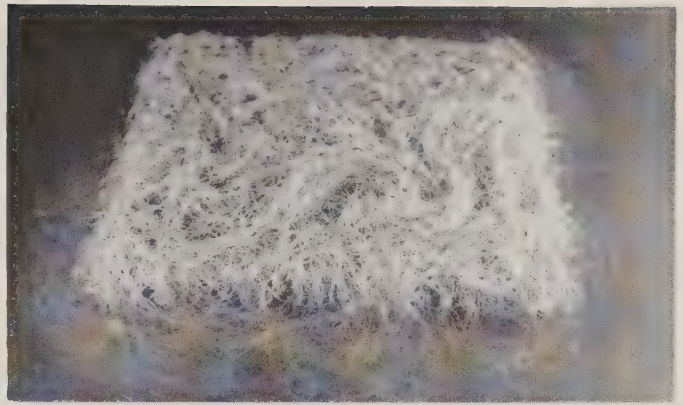
The one-eighth-size plexiglas model of the inlet to the pipe spillway on the hydraulic laboratory grounds, (above) before the model trash guard was installed, (below) after the complete trash guard was installed.







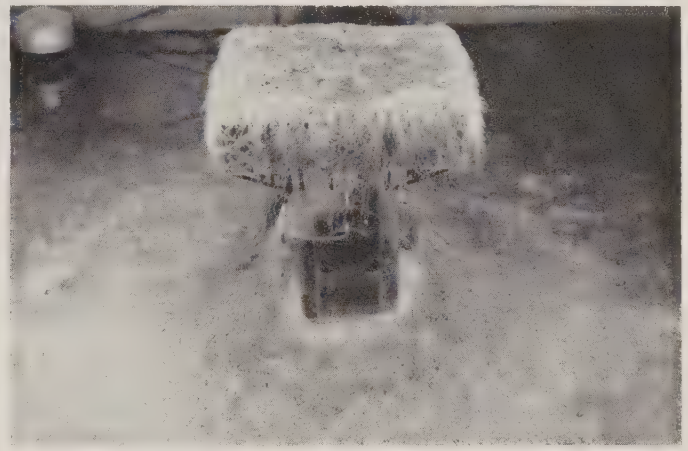
The full-size structure near the end of the trash test. Note how the hay is clogging the debris guard and preventing a full flow of water through the spillway pipe.



The model trash guard near the end of a trash test. Note that the pattern of clogging of the hemp fibers is much the same as the hay clogging of the full-size model at the left.



After the water has been drained from the pool, much of the hay trash still clings to and obstructs the trash guard of the full-size inlet.



The hemp fibers cling to and obstruct the trash guard of the indoor model in much the same way as the hay clings to the full-size model shown at the left.

These experiments have provided a technique for realistic testing of trash guard models. Now the hy-

draulic engineer can use trash model tests with confidence that they will predict accurately the behavior of

full-size structures. It is hoped that an ideal type of trash guard will soon evolve from these tests.

## Buffalo County Hits the Watershed Trail

By Kent Alverson

**B**UFFALO County in western Wisconsin is taking the watershed route to conservation—all the way.

The idea of complete conserva-

tion "from ridge to river" is taught in the schools. It's talked in farm and city meetings. It's on the way to wholesale establishment on sharply sloping hillsides of this picturesque coulee country.

Elmer Steiner, chairman of the Buffalo County Soil Conservation

District, says there is little doubt that within five years Buffalo County will be completely covered by watershed associations set up for the purpose of getting action started on watershed projects. And for some small watersheds of 2,000 acres or less that do not fit logical-

Note:—The author is information specialist, Soil Conservation Service, Milwaukee, Wis.



ly into an organized watershed association, partnership projects called "pooling agreements" are being used.

Dirt is now flying on six large earth-and-concrete structures that will tame runoff water in five finger-like valleys of the Alma-Mill Creek watershed.

South Nelson, a 9,000-acre drainage area, was approved for full-scale planning in March 1959, and planning was more than 90 percent complete by the end of the year. Garden Valley watershed, among the largest in the State with 121,000 acres, is expected to get planning assistance in 1960. And Beef River watershed, still larger with 140,000 acres, is in the process of organizing. This leaves only two principal watersheds to round out the county. It is interesting to note that in Garden Valley 85 percent of the landowners were signed up as watershed cooperators

by committees from their association.

An example of the watershed approach on smaller projects is the Schmidt and Wieka pooling agreement in which two farmers near Fountain City pooled their resources to get the protection they needed. With financial help under the Agricultural Conservation Program and technical help from the Soil Conservation Service, they have established their principal structural measures. In cooperation with two other landowners, they are also using all the land treatment measures necessary to protect a 900-acre drainage area.

Because pooling agreements are limited to only a few that can be financed each year through cost-sharing arrangements with the county ASC committee, landowners must show that they are following or will follow a good conservation program on land under their con-

trol. The more nearly complete the protection, the stronger is their claim to priority. Structures built without needed stripcropping, cover crops, and trees in the drainage area above are usually not approved for cost-sharing.

Visitors to the Schmidt and Wieka farms have no trouble in seeing why they were able to get ASC help with their project. Standing on the highest point in the road that marks the boundary between the two farms, they can see an excellent demonstration of proper use and protection of land.

On the high outside rim of the valley is native timber, protected from grazing by any domestic animals. Farther down are long, parallel strips of corn, small grain, and alfalfa hay to act as buffers to runoff water and prevent the loss of good topsoil. And in the very bottom of the valley where gullies form most easily, structures are



Ed Wieka (left) points to conservation practices on his and Schmidt's farms as he and SCS technician Lloyd Wilbur hold his land use map.



located at strategic points to stop the gully heads in their tracks.

Upper reaches of this small watershed are under the control of landowners Len Tasterson and Ben Schollmeier. They keep nearly all of their share in permanent timber and grass. The structures are on the Schmidt and Wicka farms.

What is a control program like this worth? We have the word of Donald Schmidt, who farms the lower 300 acres. "We can't praise it enough! Eventually that ditch would have eaten right on up into my neighbor's farm—and we were losing number-one land. I wish you could have seen it before this work was done." Ed Wicka, up above, also points out the elimination of flooding damage on 30 acres of land. Protection to a highway bridge below the two farms and reduction of sediment going into the Trempeleau River are additional benefits.

Protection of the tax base to help maintain good roads is especially important in figuring the value of erosion control in watershed projects like this.

Because the watershed is small, the Schmidt-Wicka project makes an ideal demonstration for groups interested in the watershed concept. One look from a good vantage point ties everything together into a neat conservation package.

For those interested in following the story further, there is the recently completed Lost Creek project in neighboring Pepin County, and other projects in various stages of progress under the Watershed Protection and Flood Prevention Act. Lost Creek has several flood detention structures. It does not have the stabilization structures characteristic of Alma-Mill watershed, however.

The important thing is that Buffalo County folks are learning to



**Flood detention dam that is typical of the control structures now being planned and built in Buffalo County. The sediment pool and entrance to the draw-down pipe may be seen in the middle distance, below the spectator.**

work together for the good of the entire area. They know that conservation is only as effective as the desire, knowledge, and skill of farm operators make it; and that conservation, like religion, is only one generation from extinction.

To make sure there will be a carryover of watershed interest and know-how to the next generation, directors of the Buffalo County district sponsor a conservation education program in all schools of the county. Last May 1,500 school children took tours to study conservation of water and soil. The tours were set up with a watershed theme, tracing the raindrop and the good or damage it does "from ridge to river."

In fact, the present watershed conservation interest in the county can be traced largely to the conservation education program of the past 19 years. The education program was started in 1941 by O. J. Schwaide, county superintendent of schools and at present the secretary of the Buffalo County Soil Conservation District. It has continued ever since on a compulsory

basis in all schools of the county. Some of the first recipients of this educational indoctrination are now leaders in the watershed movement.

Schwaide says: "When I first came to Buffalo County in 1941, I found conservation teaching to be a hit-or-miss affair. One of the first things I did was to get courses started in the 7th and 8th grades in all schools. Because some of the teachers lacked the background for it, we then started putting on an institute—a short course taught by professional conservationists. Later all of our elementary teachers visited experimental farms or demonstration areas on conservation. Now, we follow up the classroom teaching with the conservation tours so all the pupils can see the practical way these things fit in."

It may be that the well-defined drainage patterns and publicity given to Lost Creek watershed in neighboring Pepin County have also given a special boost. Whatever the reasons, Buffalo County as of now lays claim to being the most watershed-conscious county in the State of Wisconsin.



# Teams of Grasses

—for the Southeast

By Paul Tabor

**M**ANY farmers of the Southeast are now using teams of grasses for their farms. They are finding that no one grass can adequately fill all their forage and conservation needs.

The "one best grass" argument started about 200 years ago with the introduction of orchardgrass into Virginia and bermudagrass into Georgia. A few years later bluegrass began to dominate the rich limestone grazing lands of Virginia, Kentucky, and Tennessee. About a century ago Johnsongrass made hayfields of many rich cotton and corn farms on the river bottoms and black belt soils, while Dallisgrass spread over the permanent pastures of this area. Carpetgrass

came into the damp, sandy pastures of the Deep South about 1910. Yet, the one-grass economy continued on most farms of the Southeast until the last two decades, except where such invaders as Johnsongrass and Dallisgrass encroached.

The teaming up of farm grasses during the past 20 years followed the resurrection of two old grasses, rescue and tall fescue, and the introduction of three new ones, Coastal Bermuda, Pensacola Bahia, and Pangola. These five were farm tested extensively during the 1940's. Each had admirers ready to praise its virtues, overlook its faults, and sell seed or sprigs at a high price. A few years of increase brought the prices down and the experience gained enabled farmers to estimate the real value

of each. They had guidance and help from the SCS and other agricultural agencies in doing so.

A grass team common in the deep, deep South, the peninsula of Florida, is Pangola and Pensacola Bahia. The former endures more water, more alkalinity and uses heavy doses of commercial fertilizers efficiently. The latter is superior on poorer soils, survives imperfect management splendidly, and endures light-to-medium frosts better.

Dick Kelley, manager of the Monreve Ranch at Stuart, Fla., says: "I wouldn't want to be in the cattle business down here with just Pensacola Bahia. It is not as palatable as Pangola where you have clover. But I will say this much for Pensacola Bahia, I have blocks of it on land not fertilized for three or four years and can use it like range for wintering cows and they come off in good shape."

Farther north and across the State at Chiefland, W. E. Beasley, with 500 acres of Pensacola Bahia and 90 of Pangola, reported, "You need Pangola." He uses the Pangola for hay in summer, refertilizes and saves the late growth for winter grazing. The Pensacola Bahia is used for pasture and in rotation with row crops.

Coastal Bermuda replaces Pangola in the team near the upper boundary of Florida and continues in a humid belt about 1,000 miles long east and west and 200 miles wide. It is the glamour grass for



Pangola grass is an important member of grass teams for the deep, deep Southeast because of its high production and palatability when grown on fertile soils.

Note:—The author is plant materials specialist, Soil Conservation Service, Athens, Ga.



this area, performing splendidly on well-drained, highly fertilized soils. It endures local droughts perfectly, but languishes on ordinary soils with limited fertilization and on wet areas. It is used for both grazing and hay. Richard Meyer, a grassland farmer near Savannah, Georgia, told the writer, "My basic grazing is Pensacola Bahiagrass and crimson clover, but my hay is mainly Coastal Bermuda. I grow reseeding crimson clover with both grasses. I can combine seed of the clover on the Bahia, but have difficulty on the Coastal because the grass stems overgrow the clover heads."

Henry Blitch of Statesboro, Georgia, a general farmer with a strong leaning to livestock, started with Coastal Bermuda and developed 110 acres. Later, Pensacola Bahia was planted in other pastures and increased to 74 acres. Mr. Blitch said, "I like both grasses. It's easier for me to manage the Bahia for good quality grazing. The Bahia has been mighty good on rather wet land, and also on deep sand ridges. A full sod keeps down



Coastal Bermuda is an important member of most grass teams in the deep Southeast because of its high production on fertile soils. It produces excellent hay, as above, or provides superior pasture, as below, when properly cared for.



Pensacola bahia is an important member of most grass teams in the deep Southeast because of its ability to produce good pasture on the poorer soils and withstand imperfect management.

weeds. The Coastal Bermuda sometimes gets too high before I know it during a busy crop season. I graze the Coastal Bermuda until June or July, then leave it for hay. If I want extra yields, I apply more nitrogen. It out-yields Bahia when heavily fertilized and grows better on droughty land when rains are scarce."

Byron Cobb, Donalsonville, Georgia, has about 100 acres of Coastal Bermuda for grazing and hay and 200 acres of Pensacola Bahia for seed and soil improvement in a grass-based rotation. He said, "I'll keep Pensacola Bahia as long as seed sells for 10¢ a pound or more."

In southeastern Alabama, the acreage of Pensacola Bahia leads





**Pensacola bahiagrass is an excellent grass to use in sod-based rotations throughout the Southeast.**

Coastal Bermuda by a 6-to-1 ratio. A father-son partnership, that of Edgar G. and Melborn Ivey, near Webb, Ala., has 100 acres of Coastal Bermuda and 50 acres of Pensacola Bahia. "The Bahia is mighty good on wet low grounds and on stumpy new ground," observed the father. "We like Coastal Bermuda," said the son, "because we can put on more fertilizer and get more grazing and hay if we need it." The Iveys have one field of Coastal Bermuda and Pensacola Bahia intimately mixed. Farmers have been warned to keep Bahia out of Coastal Bermuda fields, but here they are both thriving together. Similar mixtures have been reported in southeastern Georgia where fields planted to either grass resulted in

partial failures and were replanted with the other. This mixture may be good for grazing, but not for commercial hay.

In the Midsouth the farm grass team may exceed a basketball team in number of players. There tall fescue, rescue, and Kentucky bluegrass reach their practical southern limits and Pensacola Bahia, Dallis, and Coastal Bermuda approach their northern limits. An example is found on the farm of J. C. Richter, Madison, Georgia, with Coastal and Common Bermuda, Pensacola Bahia, Dallis, tall fescue, and Kentucky bluegrass. He observed recently, "I consider Common Bermuda, Bahia, and Dallis short-season grasses that are good in their period of growth but may be cut short by drought. I am planting more Coastal Bermuda for grazing and hay. I like Kentucky bluegrass for cool-season grazing. If I had to use one grass only it would be fescue."

A lot of other farmers in the hills and valleys of the upper Cotton Belt agree with Mr. Richter. If fescue is given adequate amounts of commercial fertilizer or chicken manure it covers the fields with a soil-conserving blanket of green and furnishes grazing when needed most. Sometimes the forage value is low. The cause has not been determined. Research workers in this country are searching for a toxic compound in the plant.



**Tall fescue is a basic plant in most grass teams for the upper Southeast.**

R. Jarrige of France reported in 1954 that Kentucky fescue forage in the spring had about half the sugar content of Italian ryegrass. The Georgia Experiment Stations in 1956 reported greatly increased beef gains by supplementing tall fescue grazing with ground whole ear corn but almost no increase by using this supplement on ryegrass grazing. Perhaps a supplement of quickly available carbohydrate and close grazing during the active growing period will correct the nutritional deficiency of tall fescue.

Using other grasses for part of the grazing may be equally effective. A mixture of orchardgrass and tall fescue is used by many farmers in the upper part of the Southeast. Below the orchardgrass belt temporary winter grazing of small grain with or without ryegrass and crimson clover or of rescue grass is used by some to improve the nutritional efficiency of the tall fescue.

#### **Fertilizing pine trees proves profitable**

Finding the value of fertilizing forest and Christmas trees is the object of experiments conducted by Ohio and Michigan researchers. The experimenters report that fertilizer applications to red pine growing on poor soil improved the trees.

Red pine, an important reforestation species in the Lake States, showed better color and needle weight and length the first season after fertilization. Various rates of 12-12-12 and 12-6-12 fertilizers were used, with the former giving superior results.

The experimenters say the improvement in the trees was due mainly to nitrogen, a nutrient in which the humus-poor soils were extremely deficient, but that the addition of the complete fertilizer improved the production of wood tissue and resistance to insect attack.

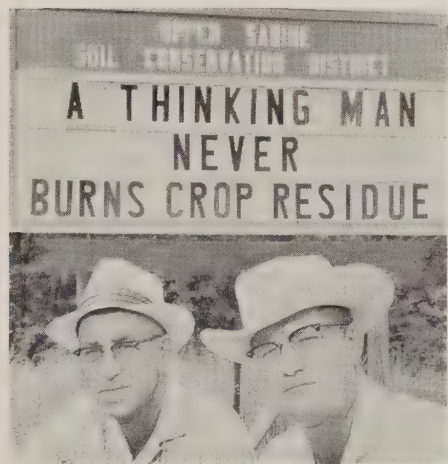
# Signs of the Times

By Charles B. Hildebrand

**T**WO large signboards, 5 x 10 feet, located at the east and west approaches to Commerce, Texas, give timely hints to cooperators of the Upper Sabine Soil Conservation District and to other interested farmers. The signs also create considerable interest in soil conservation among motorists of all classes.

The signboards were donated to the district by a local feed store owner. Messages are changed on the signs every month.

During the early summer, when grain growers were tempted to burn straw and stubble from their wheat and oat fields, the signs looked like this:



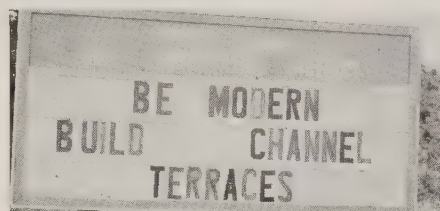
Wade McWhirter, SCD supervisor (left) and H. R. Freels, feed-store owner, in front of a district signboard.

As a result, few—if any—grain patches in the vicinity were burned. Many farmers needed only to be reminded that “Thinking men” never destroy this humus-produc-

Note:—The author is work unit conservationist, Soil Conservation Service, Commerce, Tex.

ing material that gives life to the soil. Others refrained from burning because they did not wish to be stigmatized as “Un-thinking men.”

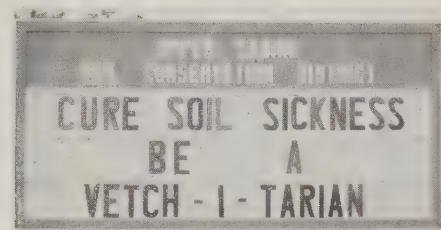
Terrace construction took a boost in the months following the appearance of this sign:



Many of the phrases or slogans are thought up by members of the district board of supervisors and the SCS staff that works with the district. Some are suggested by district cooperators or other interested conservationists.

Late last summer, with planting time for winter legumes just ahead,

the motoring farm populace was greeted by this sign:



The supervisors of the Upper Sabine district are highly pleased with the results obtained from their signboards. Favorable comments on the part of farmers and the general public are frequent. And, more important, they think these timely suggestions are getting more soil and water conservation applied to the land. Furthermore, the signboards help keep the name of the district and its mission before the motoring public.

## A New Look and a New Story

By J. L. Knight

**D**ILAPIDATED buildings, sheet and gully erosion, and other signs of neglect challenged J. T. Coffman and his wife when they bought a 202-acre farm in Carroll County, Tennessee. That was 8 years ago, in 1952.

The farm now has a new look and a new story. A modern home and a new barn have been built. Conservation practices cover the fields. Thrifty cattle and hogs graze contentedly in green fields fenced with woven wire and multiflora rose “living fences.”

Before the Coffmans purchased the farm, they consulted several agricultural agencies, including Farmers Home Administration, Soil Conservation Service, and

their county agent. They found that soil types on the farm were Memphis and Lexington silty clay loams. These are naturally productive soils that respond to good treatment. Good land use practices could be installed and maintained. A number of enterprises could be supported.

The Coffmans were assured that credit was available to develop the resources. They became cooperators with the Carroll County Soil Conservation District soon after they bought the farm.

Farming operations are based on a livestock program of beef cattle and hogs. The beef enterprise is

Note:—The author is work unit conservationist, Soil Conservation Service, Huntington, Tenn.





Brown Aden, Supervisor of the Carroll County Soil Conservation District, (left) presents a savings bond to Mr. and Mrs. J. T. Coffman as winners of the Save-Enrich Our Soil Contest in the Carroll district.

a cow-calf-feeder program. The swine enterprise consists of farrowing and feeding out about 100 top hogs to a weight of 225 lbs. each year. The land use program is designed to support the livestock program.

A number of conservation crop rotations are used. Small grain, button clover, and alfalfa are used extensively in the rotations. These rotations are major factors in bringing about the increased crop yields, according to Coffman. His corn yields have increased from 30 to 110 bushels per acre, wheat from 18 to 31 bushels, and oats from 30 to 70 bushels. With bumper yields, more land can be diverted to permanent or rotation pasture.

Natural draws in the cultivated fields have been shaped and seeded to fescue and white clover to form grass waterways. Old terraces, no longer used, have been destroyed. Contour stripcropping has been established on 50 acres.

The permanent pastures are mainly fescue and clover or or-

chardgrass and clover. These are supplemented by a 15-acre field of kudzu, and a 12-acre field of bermudagrass for summer grazing. Also, small grains and button clover are used for fall and early spring grazing. Water shortage and fence location problems were solved by building two farm ponds. New fences have been established on the contour.

Coffman planned originally to clear a 35-acre woodland area and establish pasture on it. But he changed his mind. "I took a pencil and a piece of paper and did some figuring," he stated, "and the figures showed me that I could make more money by leaving it in woodland than if I cleared it and converted it to pasture."

"It has not been easy to stay on the farm," Coffman continued. "When farm income continues to show a loss over a period of years, it takes willpower and a love for the land to keep going. We did not get in the black until 1958. One reason we finally made it was because the farm plan built around

the basic principle of soil and water conservation was flexible."

The struggle has not been without reward. Coffman was county winner in the Save-Enrich Our Soil Contest in 1957 for the Memphis trade area, and runner-up in the State contest. He received the outstanding farmer of the year award in 1958 from the Huntingdon Rotary Club. And neighbors have installed conservation practices, such as contour stripcropping, after seeing the practices demonstrated on this rejuvenated farm.

His greatest reward, in his own words, is "the satisfaction of having a job well done." He has his farm tied down with sod crops and other soil and water conservation practices. His soil will now stay at home where it will benefit him and his family, his community, and the nation.



#### **Banker's awards to New Mexico farmers**

During 1959, 12 New Mexico banks handed out a total of 77 awards to farmers and ranchers in the State for their outstanding work in conservation.

More than 500 New Mexico agricultural producers have won these awards during the past decade. They are bestowed in cooperation with the New Mexico Association of Soil Conservation Districts.

The inscription on these awards reads: "He has shown his love for the land by using it properly and establishing the necessary conservation practices, thereby maintaining the fertility and increasing the productivity of his farm. He has proven himself to be a good steward by preserving his farm for generations to come. It is in recognition of an important task well performed that he and his family are awarded this testimonial of honor."

Conservation planning brings—

# Recovery for a Sandyland Range

in southwestern Kansas

By Kelso Williams and  
P. N. Jensen

THE 920 acres of sandy rangeland southeast of Meade, Kans., didn't appear to be worth much when Carl Merkle took possession of it in 1953. The tall-growing grasses that once flourished on the hills were gone. In their stead were sand sagebrush and other undesirable shrubs and annuals. There were places with no vegetation at all, where wind and water erosion had done their worst.

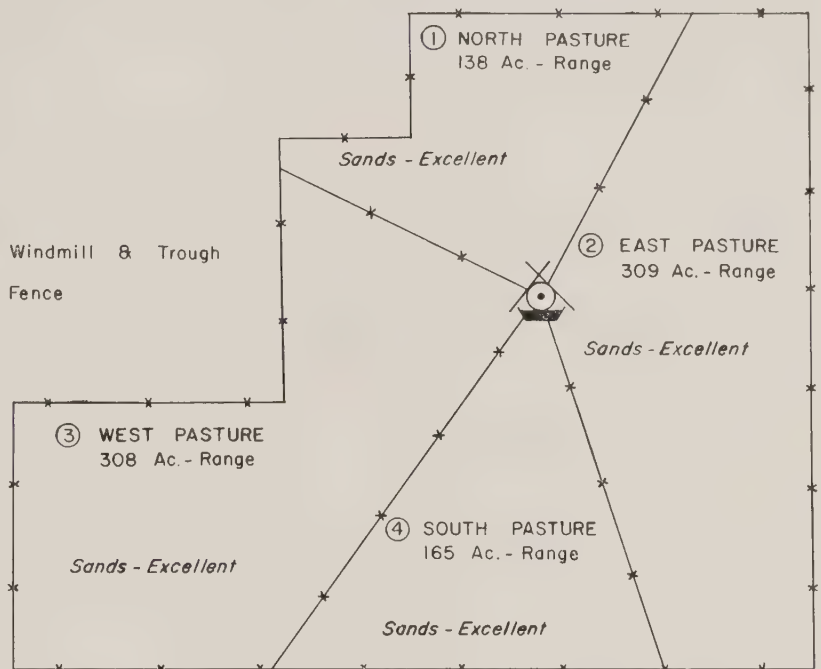
Merkle, already a cooperator with the Meade County Soil Conservation District, went to see the Soil Conservation Service men assigned to the district. He wanted to talk about a conservation ranch plan. The SCS men were delighted to cooperate.

Note:—The authors are, respectively, work unit conservationist, Meade, Kans., and range conservationist, Dodge City, Kans., both of the Soil Conservation Service.



Windmill & Trough

—x—x—x— Fence



Land use and conservation map of the 920-acre Merkle range.

With the SCS men giving him the information he needed on his soil and range resources, Merkle set

about developing his conservation plan.

He decided that overseeding the depleted rangeland was essential. Cross-fencing for livestock management would be needed, and of course he would have to provide for proper use of the key native grasses.

By the end of 1957, Merkle had seeded 600 acres of the sandy rangeland. The mixture he used mainly was one of native grasses like those that once grew so vigorously in the area—sand and little bluestem, switchgrass, and blue grama. Merkle added a little sand lovegrass to the mixture for good measure.

The plan called for resting the newly planted grasses for at least two years to give them a better chance. It was hard to find the



Carl Merkle (left) and Kelso Williams in one of the reseeded pastures on Merkle's range.



young plants the first year, but by the end of the second season Merkle could find seedlings almost everywhere.

Merkle completed the cross-fencing on schedule. In 1958, he divided the original pasture into two pastures. In 1959, he divided these two pastures again. This way he could rotate the use of the pastures.

Resting a pasture, Merkle explains, is like summer fallowing. You are storing grass for later use.

Merkle now stocks the ranch from April 1 to November 1. He begins each grazing season with a different pasture, giving the other pastures the benefit of early-season rest.

He watches the grazing carefully. When the grass in one pasture has had enough grazing, the cattle are taken to another pasture. He makes sure there is enough of the grazed plants left to make prompt and vigorous recovery.

Merkle can see real results already from planning and carrying out a soil and water conservation program. There is more grass, and of better quality. Erosion is being reduced.

Carl Merkle winters his calves on his other ranch unit in Meade County, so the keeping of accurate records on weight gains from this unit is impractical. He is sure, however, that his work is paying off in heavier calves at weaning. Calves dropped in the winter go to the other place in November weighing at least 500 pounds. He says the calves are now at least 50 pounds heavier than when he first started using this range.

Merkle gives a lot of credit to the sound soil and water conservation plan he developed with SCS help. The plan put all the needed treatment down in black and white and scheduled it according to his means and time.

# New Reservoir—

## New Ranch

By Leon Hubbard

“A reservoir has been the most important single achievement in the development of my conservation program,” declares Fred Baker, who operates a large cattle ranch on the east edge of the White Pine Soil Conservation District, 60 miles west of Ely, Nevada. He bought this ranch about six years ago when he moved from Delta, Utah.

“About all I bought was some acreage and a good water right; it was just an old, rundown ranch,” Baker declares. “In June, we had more water than we knew what to do with; the rest of the summer the stream would be so low that we couldn’t accomplish much with it. The land was almost impossible to irrigate because it was so uneven, and a considerable amount was

taken up with old weed-bound ditches. Another thing that caused trouble was the lack of correct slope on the ditches. Some of them had cut gullies down to five or six feet deep. The land had been in hay without rotation for so many years that the stands were thin and invaded by weeds.”

Fred is an old hand at getting conservation work accomplished, having done an outstanding conservation job on his land in Utah. He had been a soil conservation district cooperator there for many years. It was only natural that the first thing he did after moving to Nevada was to become a cooperator of the White Pine district and develop a conservation plan. First on his agenda was the construction of a reservoir for water storage.

After the designs were furnished

Note:—The author is soil conservationist, Soil Conservation Service, Ely, Nevada.



Fred Baker standing by his reservoir when the water is at a low level.



**Fred Baker works on a concrete collar for the pipe spillway of his reservoir.**

by Soil Conservation Service technicians from Ely and approved by the Nevada State Engineer's Office, Baker had the contractors begin in the spring of 1955. About three months later his first big reservoir was completed. The dam is 30 feet high and 720 feet long. It contains 40,000 cubic yards of fill and stores 130 acre-feet of valuable water.

The reservoir storage gives him one additional irrigation for the entire ranch and has completely stopped the gullying action of uncontrolled water in the old channel. Baker now can irrigate with the stream of water he needs rather than with what the creek happens to be supplying at the time. No longer is the high water in June (sometimes as much as 40-60 feet per second) unmanageable as in the past.

The reservoir gets a lot of heavy use by fishermen. A neighbor remarked: "It's a regular playground, and one of the few places around these parts where you can catch three-pound trout. In the

winter when the water is frozen you'll see skating parties out there every night playing hockey and having a big time."

Since 1955, Fred has moved well along the way to completion of his conservation plan. He has leveled 170 acres, most of his ditch system has been rebuilt to a uniform grade, a crop rotation system is being applied, commercial fertilizers have been used extensively, and his ranch is becoming a show-place of conservation accomplishments.

Last year, Fred harvested 9,000 bales of alfalfa-grass hay as compared to 600 in 1954. "This is evidence enough that conservation does pay off," he points out.

In 1956, a new snow course was established on Mt. Moriah, the watershed that supplies Baker's Silver Creek Ranch with water. Fred has taken an active interest in these snow measurements, and goes up with the snow surveyors every year to help with the measurements. In this way he is keeping an eye on the source as well as the ultimate use of his water.

Along with his ranch improvements, Fred has not overlooked his

range resources. He recently was granted a range allotment that includes 60 sections of public land. He already has built several stock-water reservoirs on this rangeland and has piped water  $2\frac{1}{4}$  miles from the mountains to get better distribution of grazing. He intends to fence this entire area and institute a rotation-deferred grazing system of management.

"This range has been 'grazed in common' long enough, and I intend to see that it not only holds its own, but also improves every year," Baker declares.

He recognizes the need for a complete conservation job and plans to continue with his program until all the problems are solved.

"I'm going to pipe the water from my reservoir down to the lower fields because we are losing water in that open ditch. We're going ahead with the concrete work on the diversion outlets above the dam, and plan to build cement headgates and outlets throughout the entire irrigation system. It's only good business. I'm going to convert the alfalfa fields upstream from the reservoir to improved pastures. The soils are shallow and



**Outlet structure from Fred Baker's reservoir that carries about 20 cubic feet of water per second to irrigation ditches.**



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take more frequent irrigation but the excess water returns to the creek and back into the reservoir, so in this way I feel we will get double use out of some of the water. And I will need the extra summer feed as my herd increases."

"Then I intend to clear the brush and weeds on those meadowlands way above my upper fields, and seed them to crested wheatgrass. I'm getting a little more of the job done every year, and will continue until I'm satisfied we have all the improvements needed," he concluded.

Fred Baker is sold on the idea that the ranch will return profits only when it's properly managed and all of the conservation needs are taken care of. His ranch today is proof that the fruits of his labors are being returned to him manyfold.

### Weed Killers Tested in Illinois

Some new pre-emergence weed control chemicals tested by University of Illinois agronomists during 1959 produced favorable results.

According to F. W. Slife the new compounds Amiben, Atrazine, Randox-T, and Falone gave results comparable with those of older materials. He states, however, that several more years of testing will be needed to determine whether these new chemicals can be used to better advantage than Simazine, Randox, 2,4-D, and Alanap.

In the tests Eptam injured some corn, and it is not recommended for general control of weeds in this crop. But it can be used successfully for wild cane and johnson-grass seedlings.

Both Simazine and Atrazine will control all annual weeds. Since Atrazine dissolves more quickly in water, it may perform better than Simazine in dry years. Both are recommended for pre-emergence control of weeds in corn. Slife warned, however, that these chemicals may reduce growth of spring grains following corn unless the soil is plowed or disked in the fall.

Randox and Randox-T performed well in the tests. Randox is recommended for corn and soybeans where grasses are the major problem. Randox-T is suggested for trial use in corn only to control grass and broadleaf weeds.

Alanap controlled weeds in soybeans, although in a few cases it stunted the beans early in the season. This chemical is recommended for controlling weeds in soybeans. It works especially well on broadleaf weeds except smartweed.

Both liquid and granular 2,4-D were effective in controlling weeds in corn when used as a pre-emergence treatment, but some crop damage and loss of stand occurred.

Granular herbicides will be widely available in 1960, Slife reported. Tests to date show that they perform as well as the liquid forms. But because costs may run slightly higher per acre, a farmer should make sure that the extra cost will be offset by the extra convenience in handling before he changes all of his equipment to use granules.

### Outwitting the Ducks

Nolan Rauton, a cooperator with the Greenwood Soil Conservation District in South Carolina, started a program six years ago to outwit the ducks. He wanted to attract the ducks to his farm and keep them there long enough to get in some good hunting.

So, with SCS technical aid, he built two ponds on his 350-acre farm near Lake Greenwood. He planted the banks of the lower pond to browntopmillet.

The millet brought the ducks to the ponds and held them. Now he has homemade duck hunting.

Soil testing is as much of a requirement for efficient farm management today as the use of tractors, fertilizer, pesticides, milking machines, or record books, according to Delno Knudsen, University of Nebraska extension agronomist. Knudsen points out that the soil test is "the farmer's way of taking inventory of the plant nutrients in his soil. No smart merchant can stay in business unless he keeps a well-filled stock of essential items on his shelves."

It takes the average factory worker in the United States about half as long to earn enough to pay his family grocery bill as it did 30 years ago.

He now works a week out of every month to buy food for a family of four. Back in the 1920's he worked two weeks to buy that food.

JUNE 1960

# Soil Conservation





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*Against the wooded hill it stands,  
Ghosts of a dead home staring through  
Its broken lights on wasted lands  
Where old-time harvests grew.*

—JOHN GREENLEAF WHITTIER



**COVER PICTURE.**—A multipurpose pond in Tennessee that provides running water and fire protection for the house and barn along with fishing, boating, and swimming facilities for the people.

# Soil Conservation

**EZRA TAFT BENSON**  
Secretary of Agriculture

**DONALD A. WILLIAMS**  
Administrator, Soil Conservation Service

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# Trout—A Crop of the Land

By Randy Strate

THE idea that fish—and specifically trout—are a product of the land is the guiding principle behind a new kind of watershed improvement program on the White River in west central Michigan. It is expected to result in better fishing, better farming, and a higher standard of living for all folks who live in the 132,000-acre watershed.

The White River originates in the swamps of Norwich township in central Newaygo County. It flows southwestward across the county into Oceana County and continues across Oceana County to White Lake and thence into Lake Michigan.

The Michigan Department of Conservation became interested in the White River project back in 1954. Using \$70,000 of fishing license and fishing tackle tax money, the Stream Improvement Section of the department made an inventory of the streams in the White River drainage area.

Armed with aerial photographs and base maps showing lakes, streams, roads, and towns, the Conservation Department crew went to work. They walked and surveyed the entire 131 miles of the White River and its feeder streams or tributaries.

The survey turned up many things that could be hampering the reproduction and development of trout. Stream temperatures in most of the main streams were

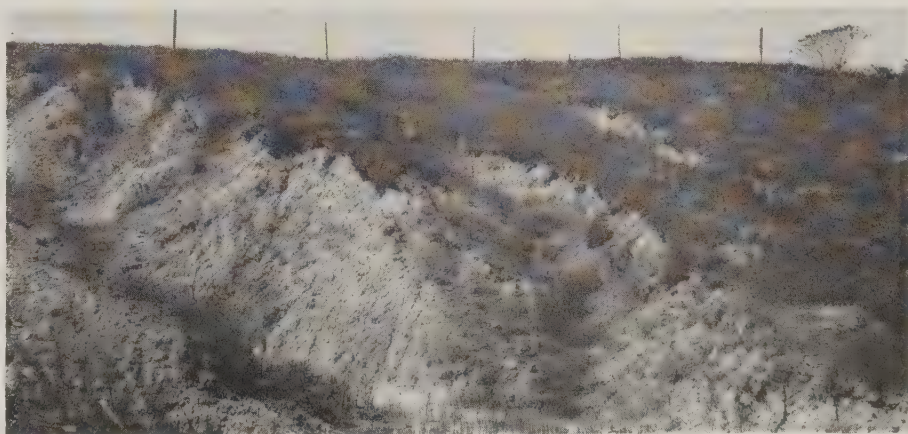
marginal for the support of trout, which require cool, clear water. Lack of trees for shade was part of the problem. Also, five beaver dams and an artificial lake backed water up into slow-moving pools that warmed up the water.

Spring floods, with their load of silt from the uplands, were filling holes, covering up spawning beds, and lowering the stream's ability to raise food for fish. The lack of escape cover and hiding places, pollution from barnyards, and many other discouraging conditions were noted. Was it any wonder that fishing was poor?

Brook trout once were common in many Michigan streams all the way to the Indiana border. Grayling, one of the scrappiest and best tasting of Michigan fish, were found as far south as the White River. Now, however, the White is considered the southernmost major trout stream in the State and grayling have become extinct.

It didn't take the Conservation Department long to find out that care of the streams and care of the land along the streams were both parts of the same problem. Pastures were being overgrazed on light, erosive soil. Fall plowing and cropping systems short on grasses and legumes were responsible for much of the silt being deposited in the streams. Streambanks were being trampled by livestock. Road ditches were being gullied in some places and filled with silt in others.

Trout probably are one of the best barometers of the kind of land use we have in a watershed. They are directly affected by water temperatures, silt flowing into streams from the uplands, the lack of shade because the timber has been cut, or pollution from a factory dumping commercial waste into the stream. Improper land use probably had been the major factor in causing the brook trout to move farther north and the grayling to become



A severely eroded field, common in the White River watershed.

Note:—The author is work unit conservationist, Soil Conservation Service, Fremont, Michigan.





Rock and vegetative cover are now stabilizing the banks of White River and its tributaries.

only a memory.

Realizing there wasn't much point in placing improvement structures in the streams if silt and warm water were to continue to enter, the investigators decided to consult with local officials of the Soil Conservation Service about these "problems of the land."

With the basic information already gathered, it was easy to swing into action. The Department of Conservation planner and the local SCS man conferred with the soil conservation district officials and other community leaders. A steering committee was formed from several organizations in the watershed and members of this committee carried the ideas and plans back to their respective groups.

Small neighborhood groups of farmers were formed. In meetings held in some of their homes, farmers were told about changes proposed on the land as part of the action program. They were asked to give easements and rights-of-way to permit construction crews to

move about unhampered. Extent of the cooperation from landowners can be seen in the fact that only one owner in the entire watershed objected to signing an easement. Promoters of the project hope his objections will be temporary.

Others were enthusiastic, too. Among those putting their should-

ers to the wheel were members of the Newaygo Soil Conservation District board, other farmer organizations, sportsmen's clubs, social clubs, U.S. Forest Service, County Road Commission, Chambers of Commerce, and individual landowners.

With the way paved for action, three crews went to work under the guidance of Conservation Department men in the spring of 1955. Control of streambank erosion and stabilization of the stream bottom drew first priority. Banks were graded, sodded or seeded on the face, and protected at the top with rock riprap. Log aprons, jetties, and streambank plantings were begun. Over a mile of rock riprap alone was needed.

Some of the structures used in the streams were single and double wing deflectors, boom covers, pine stump and sodded log covers, abutment dams, and gravel spawning boxes.

To eliminate temperature rises in the streams, beaver dams were removed. The beaver were live-trapped and moved into other



A log deflector, one of the many types of stream control structures now used to improve fish habitat in the White River.



areas where they could use their engineering skills without raising the ire of trout fishermen.

Work began on some 2,000 rods of fence to exclude cattle from overgrazed areas along the streams. Included were the construction of stiles, stream crossings, and gravel ramps to the streams for watering livestock.

At the city of White Cloud, reconstruction of an old dam was undertaken. The revamped structure has an underspill that takes cool water from the bottom of the lake instead of warm water from the surface and puts it into the stream. The cool water helps to hold stream temperature down in the hot days of July and August.

Up on the watershed farmlands, too, work has been progressing. Soil conservationists are busy working with farmers and landowners, planning with them the proper use of their land and furnishing them with the technical know-how to establish good soil conservation practices.

Proper land drainage, contour stripcropping, better crop rotations, improved seeds and seeding methods, trees planted on marginal and submarginal areas, windbreaks and wildlife area improvements are only a few of the effective conservation practices being encouraged. Goals of some practices are large and will take years to complete. In this one watershed, for example, there are 11,000 acres in need of reforestation.

The major part of the work on all 131 miles of streams in the White watershed has now been completed. A total of 149 sections of streambank have been protected; 974 stream habitat structures placed; the five beaver dams removed; an underspill dam constructed and water temperature downstream lowered by 10 degrees;



Contour stripcropping in the White River watershed.

231 rods of woven wire fence constructed to prevent livestock from grazing banks; and 750,000 trees purchased and planted by landowners.

Sponsors of the project realize that a certain amount of maintenance will be necessary, but basic work in and along the streams will stay many years without extra cost.

Harold Goyings, a farmer on the watershed and an ardent trout fisherman, recalls that the crews of the old Civilian Conservation Corps were looking for answers to a dwindling trout population way back in the 1930's. They mapped stream bottoms, put in structures, and collected stream water temperatures

"We didn't think our luck was

too bad in those days," said Harold. "With a little effort and a lot of pleasure, it wasn't difficult to fill your creel. Nowadays it's news when someone catches his limit—and the limit is a lot less than it was 25 years ago."

Goyings thinks he can see results already from the new watershed project. "Fishing has improved in numbers and size in the White. I'm certainly all for this double-barreled approach to soil conservation and stream improvement. I can enjoy better fishing and improve my farming, too."

### **Soil types classified as building sites**

Information on the fitness of various soil types in Hartford County for building sites has been published by the Connecticut Experiment Station at Storrs for use of planning officers, builders, and buyers of new houses. All soils found in the county are rated as to fitness for urban development. Of the 68 named soil series, 41 were rated as poor or very poor for urban development.



Tree planting in the White River watershed.

U.S. Department of Agriculture studies indicate that liming acid soils sometimes improves the efficiency of fertilizer utilization as much as fourfold.



# Good Fishing in Sportsman's Lake and Flood Prevention on Tiger Creek

By George Crouse

**A**N example of the far-reaching benefits that can be realized by cooperative planning to take full advantage of opportunities afforded for watershed protection and multiple use of impoundments under Public Law 566 (the Watershed Protection and Flood Prevention Act) has been presented in Oklahoma with completion of Sportsman's Lake in Seminole County.

The lake, one of 60 detention reservoirs planned to help control floods on Wewoka Creek, was recently opened for public fishing by the State Department of Wildlife Conservation. While there are many larger bodies of water in the Sooner State, none have been built with a greater measure of cooperation on

the part of governmental agencies, together with a full measure of encouragement and support from local groups. Few larger lakes have created as much interest among sports enthusiasts, who have seen exceptional possibilities for Sportsman's Lake as a recreational center.

Despite cold, rainy weather, several thousand anglers turned out to try their luck at Sportsman's in mid-February when the lake was opened for fishing.

The lake was built by the State Department of Wildlife Conservation with technical and financial assistance from the Soil Conservation Service. The State department was reimbursed for 75 percent of its share of the cost from Federal funds derived from Dingell-Johnson and Pittman-Robertson apportionments.

The 355-acre lake was built on a 1,900-acre tract acquired by the wildlife department as a game management area after sportsmen and others interested in such a project had encouraged the joint enterprise. An automatic drawdown, the principal spillway, provides for a constant level with an additional ten feet of floodwater storage during heavy rainfall periods.

Cost of construction amounted to \$132,282 in Wildlife Department funds, and \$108,056.25 in Federal funds provided by the Soil Conservation Service.

Studies revealed that almost the entire drainage area on Tiger Creek, a tributary of Wewoka Creek, was well-vegetated grassland and timber. Rock canyons and timber added to the attractiveness of the area for a fishing lake

Note:—The author is editor, OKLAHOMA WILDLIFE, official publication of the Oklahoma Department of Wildlife Conservation.



Sportsman's Lake, as seen from a park area looking toward the dam.

as well as a wildlife habitat.

The dam was completed in September 1958, and the lake stocked with fish in October. The water has remained clear, and fishermen have found the many fingers that extend from the main body of water back into the steeply banked, wooded canyons ideal spots for both boat and bank fishing. Since the lake was opened, largemouth bass and channel catfish up to two pounds and more have been caught. Only largemouth bass, channel catfish, and bluegill were used to stock the lake. It is possible other species may be introduced from the stream that furnishes a constant flow of clear water.

Seminole and Wewoka Sportsmen's clubs as well as civic groups have entered into plans for development of the recreational site and have obtained sanction from the State Wildlife Commission for various improvements for public benefit.

But the benefit by no means ends with the lake as a recreational center. Far greater value will be realized from flood prevention benefits. Rampant Wewoka Creek is one of the worst actors in the State during flood periods and has caused exten-



Bank and boat fishermen along one of the steeper banks of Sportsman's Lake on opening day.

sive damage to farmland, highways, other public utilities, and municipalities.

Oklahoma has been setting an enviable pace in the Nation for participation under Public Law 566. The watershed protection program was given added impetus when the 1959 State legislature appropriated \$338,988 for Statewide planning. A total of 73 applications involving 8,700,000 acres have been received by the State Soil Conservation Board. A construction program is well underway on seven creek watersheds.

Many believe that Sportsman's

Lake is only pioneering in a field of activity that has much to offer sportsmen throughout the Nation. The P. L. 566 program gives State departments of conservation, municipalities, and sportsmen all of the opportunity they need to make a good program better. Since this structure was started, the Watershed Protection and Flood Prevention Act has been amended to provide Federal financial aid for fish and wildlife developments as a part of watershed projects. This should provide further incentive for projects of this type by reducing the costs to local sponsoring agencies.

# A Multi-Purpose Dam in Tennessee

## *For Flood Prevention and Fish and Wildlife Development*

By H. N. Estes

**F**LOODWATER retarding structure No. 4 in the Thompson Creek watershed will be the first such structure in Tennessee designed for both flood prevention

and fish and wildlife benefits. It is the 34th such structure in the Nation built under provisions of Public Law 566, the Watershed Protection and Flood Prevention Act.

Thompson Creek watershed cov-

ers about 30 square miles in Weakley and Henry Counties, Tenn. The original sponsors for the small watershed protection and flood prevention project were the Thompson Creek Watershed District and the Weakley and Henry County

Note:—The author is assistant State conservationist, Soil Conservation Service, Nashville, Tenn.



SCD's. The project was approved for watershed planning in 1956. Structural operations were approved in the fall of 1958 and were started early in 1959. One floodwater retarding structure was completed in the fall of 1959 and a second scheduled for completion in the early summer of 1960. Land treatment in the watershed is progressing satisfactorily.

There is a shortage of fish and wildlife resources and suitable habitat for their improvement in this part of Tennessee. The Tennessee Game and Fish Commission has included in their projected longtime development program a facility for developing the fish and wildlife resources of this area.

The Game and Fish Commission previously had explored the possibilities of making Thompson Creek watershed structure No. 4 a multiple-purpose structure. But under the arrangements for allocating costs and cost-sharing, they felt that the two-thirds of the total cost they would have to bear was more than they could afford. When the 85th Congress passed the Sikes Amend-



The Thompson Creek Watershed District is proud of its watershed improvement work.

ment to P. L. 566, however, the State agency's cost for participation became considerably less.

So, the State people requested the Soil Conservation Service to take another look with them. Most of the benefits to be derived from fish and wildlife development in the watershed will stem primarily from the enjoyment of sport fishing and hunting. The inclusion of storage capacity to provide for fish and wildlife development will enhance the opportunities for harvesting

fish and wildlife. These additional benefits are considered to equal the added cost.

The State Commission negotiated with the local sponsoring organizations to join them as a sponsor. The structure was redesigned to serve the multiple-purpose use. The normal pool was increased from 56 acres to 184 acres. Total storage capacity was increased from 975 acre-feet to 2,423 acre-feet. The new capacity provides for 210 acre-feet of sediment storage, 890 acre-feet for floodwater detention, and 1,323 acre-feet for water supply pool.

This multiple-purpose structure is estimated to cost \$154,000. Estimated cost of the original structure planned was \$76,000. The Federal Government and sponsors will share equally in the difference of \$78,000. Under the approved cost-sharing arrangements for the multiple-purpose structure, the Government is furnishing \$65,000 for construction cost and \$28,000 for engineering services, amounting to a total cost of \$93,000.

By agreement with the Thompson Creek Watershed District, the State Commission agreed to furnish easements and rights-of-way for the facility. Instead of perpetual easements, they purchased all of the land needed for the impoundment of water at a cost of \$31,000. Included was enough area for public access to the reservoir. The Watershed District is administering the contract at an estimated cost of \$1,000. Total cost to the sponsors is estimated to be \$61,000.

The Tennessee Game and Fish Commission has built a number of small lakes for fish and wildlife in Tennessee. The average cost per acre of surface area has been \$700. This Thompson Creek Lake will cost them \$332 an acre.



Floodwater retarding structure No. 5, the first completed on the Thompson Creek watershed.

# PLANT NEMATODES AND SOIL MANAGEMENT SYSTEMS

By Joseph M. Good

THE fact that plant-parasitic nematodes are an important factor in soil management has long been recognized by growers of certain crops. Farmers growing sugar beets in the Western States have been using rotations for control of the sugar beet nematode for many years. Nematode control by use of chemicals has become a standard practice in the pineapple fields of Hawaii; and a large percentage of the flue-cured tobacco in the Southern States is now grown on fields treated with nematocides. More and more vegetable growers and cotton farmers are becoming users of nematocides as trials have made their advantages apparent.

There have been many trials in recent years of nematocides on soil planted to other crops. For many of these, it is obvious that the use of chemicals is out of the question because of the expense; but the trials have shown that many crops grow much better when the nematodes are controlled and that other nematode control measures should be considered. Much of this information is unpublished, and only a small fraction of it has reached the farmers who can benefit from it. In fact, many farmers have never heard of plant nematodes, and comparatively few have ever seen one, although they can be found by the hundreds of millions per acre in most soils.

Most nematodes are so small as to be almost invisible to the naked

eye except under the most favorable conditions. In England, nematodes are called eelworms; and, as this name implies, they are typically eel-shaped worms. Their average length is only about  $1/32$ nd of an inch and their average width is about  $1/1000$ th of an inch. Important exceptions are the females of the root-knot nematodes and of the cyst nematodes, which are about  $1/50$ th of an inch wide.

For the most part, plant nematodes feed in or on plant roots, though some feed on other underground parts such as tubers, bulbs, or rhizomes; and a few feed on stems, leaves, or even flower parts. In only a few cases is the damage easily recognizable as due to nematode attack; most nematode damage can be, and often is, overlooked or attributed to other causes, such as "worn-out" soil, changes in soil type, fertilizer burn, and poor drainage. The situation is further

complicated by the close association of nematode damage with diseases caused by some plant-pathogenic bacteria or fungi.

There are stem and bulb nematodes that are internal parasites of oats, rye, alfalfa, clover, and other crops. Infected plants have puffy, twisted, and distorted stems and leaves. One species of stem nematodes attacks Irish potatoes, causing extensive rot of the tuber. Bud and leaf nematodes attack the leaves and buds of chrysanthemums and strawberries, greatly impairing growth and reducing quality and production.

The many species of nematodes that attack plant roots, however, cause the greatest economic damage to agricultural crops. Such external root-feeding nematodes as stubby-root and sting nematodes cause short and stubby roots, while other external parasites such as spiral, stunt, and ring nematodes destroy lateral roots by attacking behind the growing root tip. In both cases, destruction of root tissues produces root decay and causes poorly developed root systems.

Then there are internal root-feeding nematodes such as root-lesion and burrowing nematodes that invade the root tissues and migrate through the roots as they feed. As infection progresses, the roots decay and slough off, leaving a decayed and restricted root system. The well-known root-knot nematodes are internal parasites

Note:—The author is nematologist, Agricultural Research Service, Tifton, Georgia.

## No. 55

**This is the fifty-fifth of a series of articles to appear from time to time in explanation of the various phases of research being conducted by the Department of Agriculture on problems of soil and water conservation.**



that feed in one location and cause conspicuous swellings of the roots, known as root knot.

Also, root-feeding nematodes are known to increase the severity of several plant diseases caused by pathogenic fungi; a common example is *Fusarium* wilt. More recently, workers in California have shown for the first time that a nematode can transmit a plant virus. They found that a species of dagger nematodes, an external root parasite, transmits the fanleaf virus disease of grapevines.

Plant injury caused by parasitic nematodes reduces plant stands and yields, shortens the productive life of most plants, and for some crops lowers quality and market prices. Badly injured plants often have a tendency to wilt on hot, dry days, particularly in the late afternoon. Infected plants usually are stunted and show signs of nutrient deficiency. In many cases, plants showing nitrogen, potash, phosphorus, iron, copper, zinc, and magnesium deficiency lack these nutrients not because of an inadequate supply of nutrients in the soil but because the damaged root system of the plants cannot obtain sufficient nutrients from the soil. Additional applications of fertilizer in such cases may compensate for some nematode damage, but

this is not a satisfactory substitute for a healthy root system.

Most plant nematodes are specialized parasites; that is, they feed and reproduce on some crops but not on others. The degree of specialization varies with the species; some are highly specialized and attack few plants, whereas others attack a wide range of crop plants and weeds.

An example of a highly specialized parasite is the soybean-cyst nematode which reproduces on soybeans and a few other leguminous plants, but will not reproduce on the great majority of crop plants or weeds.

The common root-knot nematode of the Southern States (the cotton root-knot nematode) and the root-lesion nematodes are examples of much less specialized parasites. They attack and reproduce on a wide variety of crop plants and weeds. Others, such as the sting nematode, are intermediate in this respect.

The growing of any one crop year after year on the same field is certain to result in an enormous increase of nematodes that specialize on that crop. If planting of the same crop is continued long enough, nematodes specializing on that crop will almost certainly increase to the point where the crop is seriously

damaged. Crop rotation tends to prevent this. Many nematologists consider nematode control one of the principal advantages of crop rotation.

When soybeans are grown year after year on soil infested with soybean-cyst nematodes, yields decline and the typical yellowing and stunting of the "yellow dwarf" disease caused by these nematodes appears; but if soybeans are rotated with a crop which is not attacked by this nematode, even for one year, fair crops of soybeans can be grown even on soil which has become heavily infested. A two-year rotation of nonsusceptible crops is even better. However, it is very difficult to eliminate this or any other plant nematode from the soil by crop rotation. If two successive crops of soybeans are grown after the nonsusceptible rotation crop, the second soybean crop almost invariably will be severely damaged. The reason is that the first good soybean crop provides ideal conditions for the increase of the surviving cyst nematodes and increases their numbers back to a dangerous and economically damaging level.

The same principle of rotating nonsusceptible crops with susceptible ones applies to the control of other nematodes that reproduce on only a few hosts. With a species like the cotton root-knot nematode, however, rotation planning becomes difficult because only a few plants are not susceptible to this nematode. Peanuts, for example, are not attacked by the cotton root-knot nematode, but they are attacked by two other species of root-knot nematodes. Therefore, peanuts can be used in rotations to control root knot on cotton; and, conversely, cotton can be used to control the root-knot species that attacks pea-



Irregular growth of celery caused by sting nematodes.

nuts. Thus it becomes evident that knowledge of the kind of nematodes present in a particular field and their habits is essential to intelligent planning of nematode-reducing rotations.

In this connection, cover crops must be considered because they maintain and increase nematodes if they are attacked by the kinds damaging the main crop. Many farmers have promoted nematode problems by growing clover, cowpeas, lupines, winter peas, vetch, lespedeza, and soybeans as cover crops. These plants are excellent hosts for many types of widely distributed nematodes and are sometimes badly injured themselves. Small grains and grass sod have proven more satisfactory for root-knot nematode control than most legume cover crops. However, this is true only for root-knot nematodes, because many other types of nematodes increase on grains and grasses.

In addition to crop rotation, other soil-management practices have been found helpful in controlling nematodes under certain conditions. In southern Florida, root knot can be controlled on some soils by flooding the land for several weeks. Elsewhere, summer and winter fallows with repeated plowing and disking of the land for several months have been effective. In many locations, however, such practices are harmful because the soil texture and structure may be altered by rapid loss of organic matter.

Another practice that has helped reduce nematode populations is the plowing out of nematode-infected roots after harvest. Such a system kills many nematodes by exposing the roots and nematodes to the drying action of sun and wind, and also prevents any further reproduc-

tion of nematodes on the crop roots. In the Southern States there is ample time for development of two or three generations of nematodes on the roots of tobacco between the time the last of the crop is harvested and the time the tobacco roots are killed by frost. Unless the tobacco roots are destroyed immediately after harvest, there normally is a large increase in nematode numbers in the soil.

Another approach to nematode control is the development of nematode-resistant or tolerant crops. Such work is now in progress at many locations in the United States, and substantial progress has already been made.

Within the past several years soil fumigants known as nematocides have begun to play an increasingly important role in the production of many field, truck,

and tree crops. Nematocides are customarily used in cases where crop rotations cannot be used or have proven inadequate for controlling nematodes.

A number of nematocides and general soil fumigants are now available. Some are gases such as methyl bromide and must be used under covers. Others are liquids and must be used as preplanting applications in order to allow sufficient time for the fumes to escape from the soil before planting. Certain types can be applied at planting time or as a post-planting application around living plants. Solid carriers have been tested and found satisfactory for use with some nematocides.

In summary, the following points should be remembered if nematode

(Continued on p. 259)



Roots of blue lupine that are severely injured by root-knot nematodes.



# A Simple Exhibit

By Quentin S. Peterson

**T**HE directors of the Dickinson Soil Conservation District wanted an effective but inexpensive exhibit for the county fair. In looking over the list of district co-operators last summer, the directors noticed that the list included Dr. Fornetti, a local dentist who also operates a tree farm, and the Novara brothers, building contractors and landowners whose conservation plan is designed mainly to utilize wildlife and timber re-

sources to the best advantage. Also on the list were Henry Guillani, a prominent farmer and one of the district's first co-operators, and Henry Peterson, district forester with the Michigan Department of Conservation. Couldn't these co-operators help promote the district's program? The directors thought so, and sent me on a photographic mission.

It took me only a few hours to take pictures of the co-operators working at their varied occupations. Then, to illustrate the rela-

Note:—The author is work unit conservationist, Soil Conservation Service, Iron Mountain, Mich.



Henry Guillani says: "Ten years of conservation farming has proven to me the value of a conservation plan."



Henry Peterson says: "My conservation plan provides me with soils information useful in selecting proper tree species."



Mrs. Eldon Sougstad says: "To help insure tions, have a conservat







Ensure adequate food and shelter for future generations. Conservation plan for your land."

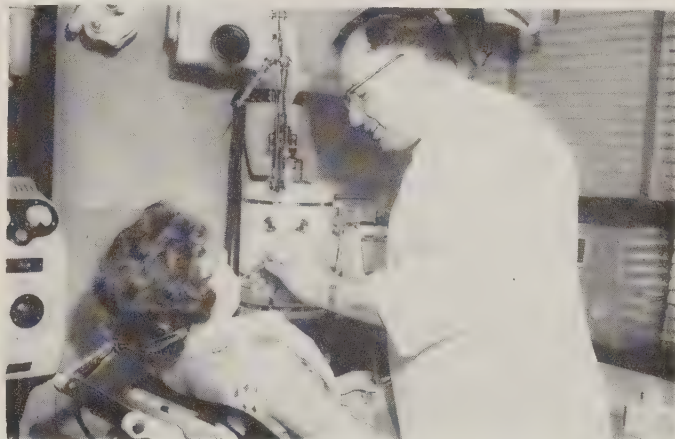
relationship between soil and water conservation and the family food supply. I took a picture of Mrs. Eldon Sougstad pouring milk for her two children, Karen and Gregg. We figured that these people, identified mostly with urban activities, would be living testimonials to the effectiveness of the district's program.

The directors ordered 24- by 30-inch mounted enlargements of the five photos, and had three sheets of 4- by 8-foot pegboard framed and hinged to form panels on which to mount the photos. Captions explained the cooperators' activities and their interest in soil conservation.

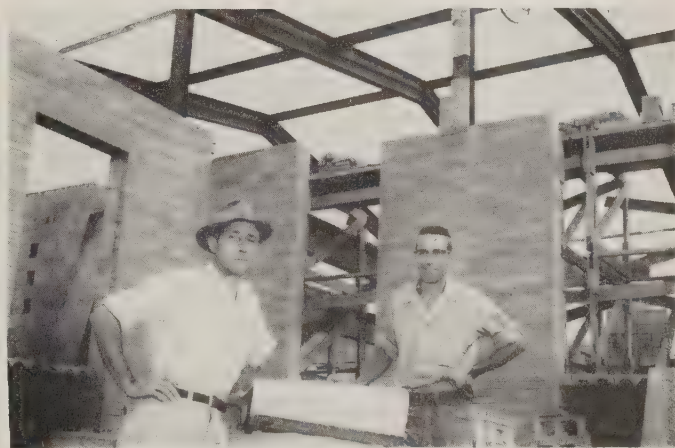
This exhibit captured the atten-

tion of more than 25,000 people during a Labor Day weekend. Many who previously had known nothing about soil conservation asked questions and remained to visit with the directors. Some left to return later with friends. At least half of these visitors recognized one or more of the cooperators pictured.

Why did this simple project attract so much attention? With the comfortable assurance of hindsight reasoning, we think we know the answer. It didn't teach or preach or educate. It was about people—just everyday people—what they believe in and what they are doing about it. It helped us show our community that "Conservation Is Your Job Too."



Dr. Fornetti says: "My conservation plan outlines a plan of operations for my tree farm."



Joe and James Novara say: "Conditions favorable to wildlife are provided for in our conservation plan."



# Grass Cover for a Dam and Spillway

By Tillman E. Lee

A large farm pond on the farm of D. K. Hood, Blount County, Tennessee, was completed in the spring of 1958. To get sod on the dam and spillway before fall rains could cause serious erosion, the farmer set out immediately to establish grass cover. The first step was to fertilize and lime the area (right). Manure had been applied and lime was being spread at the time the picture was taken. Fescue was seeded at the rate of 40 pounds per acre. Then a straw mulch was spread and anchored over the new seedings on both the dam (below) and spillway (right center). By late fall the fescuegrass had made sufficient growth to prevent serious erosion on either the dam (lower left) or the spillway (lower right).



Note:—The photographer and author for this picture story is work unit conservationist, Soil Conservation Service, Maryville, Tenn. This sequence of pictures won first place in Statewide competition among SCS employees in Tennessee for the best photographic essay of 1958.



# Conservation on the Nipan-Tuck

By I. W. Fobair

IT was a typical Nebraska winter morning, except for the dense, low-lying fog. So it was a real pleasure to be in the warm and cozy Richards kitchen, viewing the snow-blanketed acres of the Nipan-Tuck Ranch on a late January morning.

Nipan-Tuck, the name bestowed upon it by its owners, Bill and Marge Richards, spraddles lazily over the Republican River breaks, just north of Orleans, Nebraska, in the Harlan County Soil and Water Conservation District.

William E. Richards, the recently re-elected President of the National Association of Soil Conservation Districts, stated: "Conservation planning is a 'must' for any successful farming or ranching operation." That was my purpose in being there that winter morning—to assist the Richards in revising their conservation plan.

Major land use changes in recent years called for a revision in Bill's conservation plan. The purchase of additional land called for the seeding of some marginal land to native grass for summer range. Two new irrigation wells necessitated a revision in irrigation water management practices. And the resulting increase in assured winter feed reserves brought a need for an increase in livestock units. These were some of the changes Bill Richards wanted to discuss in revising the plan for his ranching operations.

We discussed the plan and made

the revisions Bill deemed necessary. Then we discussed conservation in general and specifically soil and water conservation on the Nipan-Tuck Ranch.

The Richards are not newcomers to conservation. Bill and his father, L. J. Richards, as well as his brother Reid, became district co-operators shortly after the formation of the Harlan County district in 1940. But his interest dates back even beyond that. In 1933, during a summer vacation from college, he was helping his father on the original homestead, now a part of the Nipan-Tuck Ranch. It was then that Bill and his father observed the first terraces on a nearby farm, constructed with the assistance of a local CCC camp.

Bill's father and many other farmers were skeptical about the terraces. But Bill had the opportunity to lease this terraced land in 1935, and he now states emphatically, "We could see immediately that those terraces were serving a very good purpose. I was primarily interested in the conservation of water the first two years, but I found in 1937 that they had another purpose equally important. This was brought out by observing the results of land destruction following a high-intensity rain."

"This storm had washed out a livestock dam, also established by the CCC Camp in 1933, probably because of a badger hole," related Bill. "The dam was large—nearly 20 feet high—and I was unable to



Mr. and Mrs. Richards (seated) discuss their conservation farm plan with I. W. Fobair, SCS technician.

Note:—The author is work unit conservationist, Soil Conservation Service, Alma, Nebraska.



repair it for some time because heavy earth-moving equipment was not available. I walked up through the overfall some time later and to my surprise found that six feet of silt had been deposited behind that structure in just four years. This silt had been deposited in layers and I soon realized that each layer represented each rain of consequence that had occurred. We were obviously losing our topsoil at a rapid rate, since we had treated only about one-sixth of the area above the dam at that time."

Needless to say, these early observations pointed out to Bill the need of conservation as well as the dual purpose being served by the terraces—soil as well as water conservation. Now several miles of terraces and their associated contour tillage operations and residue management practices form an integral part of the Nipan-Tuck landscape. A reconstructed livestock dam and new ones, native grass seedings, up-to-date irrigation practices, shelterbelts, and management

practices lend support to the application of Bill's conservation plan.

Because of his early activity and enthusiasm in conservation and his sincere desire to help others, Mr. Richards was elected a supervisor of the Harlan County Soil and Water Conservation District in 1944. He has served as chairman on the local board and is still an active member. He became a director of NASCD in 1952, was Nebraska association president in 1956-57, and was national vice president four years before becoming the association's fifth national president. He was one of the first recipients of the Ak-Sar-Ben Agricultural Achievement Award and is an honorary lifetime member of the Soil Conservation Society of America.

Naturally, all of this activity has represented a good many hours, days, and even weeks away from the Nipan-Tuck. It has meant a lot of personal sacrifice to farmer Bill. The Richards do not have a

family, which tends to make longer for Mrs. Richards the hours when the farmer and rancher is on the road.

"You find yourself wanting to be selfish—hoping he won't be gone so much," Mrs. Richards said. "But when you look at how important soil conservation is to our country and its growth, the miles and time away from home seem well worth it."

With such a philosophy, Mrs. Richards has always been an inspiration to Bill's endeavor. Bill further measures his reward through the many fine friends and acquaintances he has made over the years in carrying forth his philosophy of "using each acre according to its capability and treating it according to its needs."

### **Research Aimed At Bunchgrass Return**

Two valuable perennial bunchgrasses—once abundant but now scarce in the West—may return as forages. ARS scientists are trying to develop strains of Indian ricegrass and green needlegrass whose seed will sprout instead of remaining dormant.

Overgrazing greatly reduced stands of these grasses. Ranchers were unsuccessful in restoration because most of the seed remained dormant.

Moist-chilling or scarification of the seed with acid increases germination, but these methods are cumbersome, costly, sometimes dangerous, and not always successful.

Indications are that new strains can be developed without the characteristic of seed dormancy, says G. A. Rogler, ARS agronomist at Mandan, N. Dak.

Tests at the Northern Great Plains Field Station show that various strains of the grasses have different seed dormancy characteristics. These strains are being crossed in efforts to select for increased germination.



Bill Richards in front of one of his farmstead windbreaks.

# Assistant Supervisors

## —Members of a Team

By S. H. Keller

**A**MONG the first soil conservation districts to hit upon the idea of naming "assistant district supervisors" to help with official projects was Cowley County Soil Conservation District in Kansas.

The minutes of the district board meeting of October 19, 1948, carry this note: "The November meeting is to be a dinner meeting with a special program for assistant district supervisors."

More than a year earlier the Cowley County board had started sending special invitations to farm-

er and rancher cooperators to attend meetings with the idea of making some of them assistants.

This idea took solid root and has paid off in many ways, not only to the Cowley County district but also to scores of other districts both in and beyond Kansas' borders. More than half of the 105 Kansas soil conservation districts now have assistant supervisors.

During the 11 years since the Cowley board named the five assistants, 42 men have served in that capacity. The selections have not been limited to farmers and ranchers, as are the district supervisors themselves. Business and professional men get the assignments, too.

Some of the assistants who "graduated" to membership on the district board are Charles DeMott, Ray Evans, Paul Clover, Joe Warren (now board chairman), and Milton Kroth.

Each farmer who is chosen by the Kansas Bankers Association for its soil conservation award is automatically invited to serve as an assistant.

Spelled-out duties of these assistant supervisors are: (1) to report needs and promote soil conservation work in their neighborhoods; and (2) to offer suggestions and take part, with voting privileges, on business matters.

The assistant district supervisors

Note:—The author is work unit conservationist, Soil Conservation Service, Winfield, Kans.



At almost any meeting of the Cowley County Soil Conservation District you are likely to find a group similar to this. Standing, from left, Max Quinn, ASC committeeman; Harold Walker, banker; Ernest Hower, Raymond Muret, Noble Bradbury, and John Story, assistant supervisors; Dana Scott, county ASC chairman; Albert Roberts, county commissioner; and Floyd Lowe, assistant supervisor. Seated, from left, Sam Keller, SCS technician; Howard Elrod, supervisor; Joe Warren, board chairman; Charles Smith, county Extension agent; and Milton Kroth, supervisor.



help the board on such projects as the annual meeting, tours and field days, preparation of district material for the special conservation edition of the Winfield Daily Courier and distribution of the edition, and district participation in contests (the board won first place in the Goodyear contest in 1958 and second place in two previous years).

Many of the district's successful projects would not have been nearly as successful without the help of the assistant supervisors, the supervisors agree.

Assistants whose contributions suggest the valued help these people can give are Carl Whitson, writer on the Winfield Courier, and Rev. S. Ben Finley, until recently Pastor of Tisdale Methodist Church, 8 miles east of Winfield.

Whitson carried on an aggressive educational campaign to acquaint his readers with the program of the district and with the need for soil and water conservation.

Finley's work included lectures on soil and water conservation in 46 Kansas districts while he served as assistant.

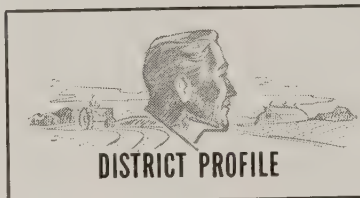
The Kansas Association of Soil Conservation Districts recognized both men with Certificates of Merit. The Cowley district is the only one having two assistant supervisors win this award.

The Cowley County district board sizes up the help of its assistants this way:

1. They take over a good share of the work load, which usually is more than the five-man board can handle.
2. They are a source of candidates already qualified to serve as members of the board.
3. They can give first-hand information to more farmers

and ranchers, multiplying vastly the effectiveness of the board's program.

4. Their participation in board meetings is of great help in planning and in reaching decisions.
5. They offer "grass roots" experience upon which to base and evaluate technical aspects



SOON after the supervisors of the Cowley County (Kansas) Soil Conservation District started the custom of electing assistant supervisors to help them carry out the district's program, they found a church pastor that they figured they needed as an assistant supervisor. The Reverend S. Ben Finley, pastor of the Tisdale Methodist Church, was also a part-time farmer—and a conservation farmer.

For 6 years (1953-59), the Rev. Finley served as assistant supervisor in the Cowley district. During that time he helped do something about the agricultural as well as the spiritual needs of families in his community. He promoted scientific agriculture, better rural living, and conservation of soil and water on individual farms and in watersheds. While he was pastor at Tisdale church, Finley lectured on conservation in 46 counties in Kansas. At the request of officers of the National Association of Soil Conservation Districts, he participated in national missions of agency cooperation and now is collaborating on a "national land use policy" and program for the Methodist Church.

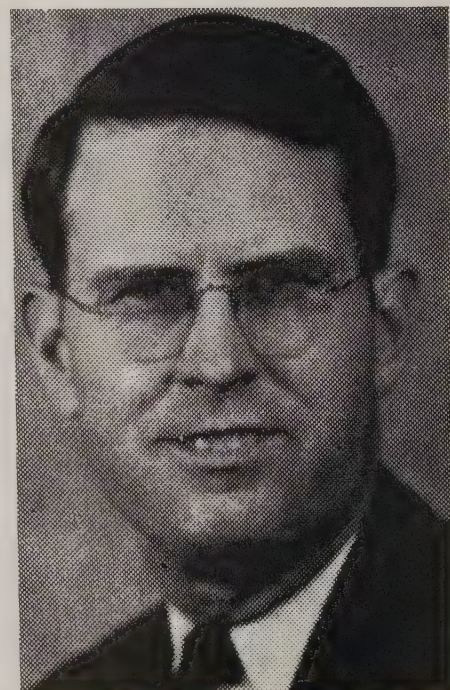
of the district program.

The members of the present Cowley County Soil Conservation District Board declare in no uncertain voice the worth of the board's assistants in their program. "Whatever we accomplish as a district we have to give a lot of credit to them," is the way they put it.

## *He Practices What He Preaches*

Finley is ready to try new things. In 1955, the Board asked him to arrange a "Flying Conservation Farmers" field day. This he did with a local aircraft company. Several 4-passenger plane loads of co-operators went up during the afternoon of Saturday, December 31, 1955.

Rev. Finley has acquired a varie-



Reverend S. Ben Finley.





**Preacher-farmer Finley (left) helps a neighbor set up a self-feeder for his calves.**

ty of personal skills, too. He goes farther than just preaching—he practices! This applies to farming enterprises as well as to his regular church work. Rev. Finley operated the farm which goes with the Pastorate at Tisdale church. He helped neighbors with livestock and operated farm machinery. He bred and raised his own herd of registered Angus cattle.

One day last spring I stopped in and found Rev. Finley in work clothes ready to go to Forrest Roberts' to help work cattle (tattoo, vaccinate, etc.).

Finley also has time for world-wide activities and believes that international exchange of produce directly affects farmers. Hence, he cooperated with other agencies in promoting the "Little United Nations" for 6 years. "Little United Nations," the only organization of its kind, has already had wide publicity. It is to be held in Sumner and Harper Counties, Kans., in 1960.

Finley also directed "Heifers, Incorporated," a program whereby local church members donated cattle and shipped them direct to farmers in Austria and West Ger-

many in the spring of 1957. District cooperators Bob Briscoe and Harold Moon of Tisdale church went with the cattle.

He directed the sending of Jersey bulls to Greece in the spring of 1959. Harold Cole of Wellington, Kans., and Royce Moon of Tisdale accompanied this shipment.

Rev. Finley sponsors student pastors from Southwestern College at Winfield to work with the Tisdale Rural Church. Southwestern College is international in its influence, with many foreign students enrolling each year.

The most recent event among Finley's conservation activities was the presentation of an award to him at the November 1959 convention of the Kansas Association of Soil Conservation Districts. This was a "certificate of merit for outstanding service toward the furtherance of Soil Conservation in the State of Kansas."

—S. H. KELLER

Less than 15 percent of the young people growing up on farms today will stay there as owners or managers.

## **PLANT NEMATODES**

(Continued from P. 251)

damage is to be reduced: Look for indications of nematode damage and try to find out what species are causing trouble; use a wide variety of crop plants in long rotations, avoiding susceptible plants as much as possible; use small grains and grasses instead of legumes as cover crops where root knot is a problem; use nematode-resistant varieties when they are available and suitable for the region; and destroy the roots of plants badly infected with nematodes immediately after harvest. These measures are more effective in preventing nematodes from increasing than they are for controlling large populations once they have become established. Soil fumigation with nematocides should be considered when nematodes become a limiting factor in economic production of crops, provided the crops have sufficient value to justify the cost of fumigation.

### **Root-knot nematodes decrease value of tobacco crops**

North Carolina tests show that the value of tobacco crops was increased by about 25 percent, or \$200 to \$250 per acre, where tobacco was grown in rotation with grass and small grain crops instead of growing tobacco on the same land for 4 successive years. The increase in value of the crop was attributed mainly to a decrease in numbers of root-knot nematodes in the rotated fields.



For the 1960 census, the Bureau of the Census describes a farm as: "A farm henceforth must have ten or more acres with agricultural sales of \$50 or more per year. Or if it is less than ten acres, it must have a minimum sales of \$250 of produce per year."



# Quackgrass for Orchard Cover

By John E. Moats

**G**ROW top-quality apples in a heavy quackgrass sod? They said it couldn't be done, but Chester Frazier did it.

Frazier came to the Wenatchee Valley in 1928 from Minnesota. He worked at various orchard jobs until 1944 when he took over the management of Dr. L. E. Hutchinson's 30-acre orchard on Sunnyslope Farm.

Apple worms were a serious problem when Chet took over the management of this orchard, but he reduced them to practically nothing the first year by a good spray program. Nearly all the Delicious trees were of the old common varieties, but at present most of them are of the new red strains. This was accomplished by grafting over and

replanting.

Frazier had many soil and water problems, so in 1950 he became a cooperator of the Wenatchee-Entiat Soil Conservation District. A complete conservation plan was prepared with assistance of SCS technicians, and he started a longterm program of building up the soil.

One of the first jobs was to correct an acid condition in the soil by applying two tons of lime per acre. The orchard had been clean-cultivated with a disk several times each year. This practice was discontinued, and 20 acres were seeded to Ladino clover and chewings fescue. The other 10 acres reverted to a heavy quackgrass sod as soon as the disking was stopped.

Frazier tried for several years to get rid of the quackgrass; it had a reputation of being a pest in or-

chards. He finally decided he couldn't get rid of the quackgrass, so he would leave it and see how it worked as a permanent cover crop. As Chet now comments, "I don't know why we should try to get rid of quackgrass, because there is nothing wrong with it. It is top-flight cover. It requires no more nitrogen than any other grass, probably could get along with less, and it helps build better soil."

When the cover crops are high enough to mow, a rotary beater is used. This leaves the chopped grass on the surface as a mulch. Loss of water by evaporation is decreased, and the tilth and structure of the soil are improved. Chet reports: "The soil condition has changed from compacted to loose and mellow, due primarily to the cover crops."

Note:—The author is work unit conservationist, Soil Conservation Service, Wenatchee, Wash.



Spraying apple trees on the Chester Frazier farm.



With the exception of large limbs, all tree prunings are left on the ground and are shredded by the rotary beater when the cover crop is mowed the first time. Frazier times the roto-beating of the grass so that the cut is made when the growth is green.

Chet has been testing methods of fertilizing and amounts of nitrogen to apply for several years. Since he wished to maintain a good permanent cover crop, he broadcast all of his nitrogen for the grass and trees. Three-fourths of the nitrogen was put on in the fall and the balance in early spring. He started out using approximately 180 pounds of actual nitrogen per acre. At present, he applies only 100 pounds per acre per year. This amount has been sufficient, and no nitrogen deficiencies are in evidence even under the heavy quackgrass sod.

A good measure of Frazier's success as a conservationist and fruit grower is attributed to his irrigation methods. With the help of SCS technicians assisting the Wenatchee-Entiat district, he converted from rill irrigation to sprinklers in



Mr. and Mrs. Chester Frazier.

1951. Rather than guess, Frazier uses a soil auger to determine when to irrigate and how much water to apply. He says he uses much less water with his sprinklers than he did with his old rills, and that this method of irrigation helps him to maintain his excellent cover crops.

The quality and quantity of the apples raised in this orchard are well known throughout the fruit industry. This Frazier attributes primarily to his soil and water conser-

vation practices.

In 1957 the Wenatchee Chamber of Commerce selected Frazier and his wife as "Mr. and Mrs. Conservationist of the Year" for their outstanding achievements in the conservation of soil and water.

Recently Chet Frazier took over the managership of another run-down orchard and is starting a longtime program of building it into a topnotch, productive orchard.

In February 1959 Frazier became a member of the board of supervisors of the Wenatchee-Entiat district, and says he will be able to spread the gospel of conservation a little easier among all the farmers in the district.

### **Hybrid Sorghums Outyield Standard Varieties**

Hybrid grain sorghums consistently outyielded the best standard varieties in 2-year tests at 6 widely scattered locations in Kansas. On an average, the hybrid yields were about 20 percent higher than that of good standard varieties. But some of the hybrids did considerably better than that.

From 3 to 5 of the best adapted standard varieties were tried in competition with more than 40 hybrids at each of 6 locations. At no place did a standard variety place higher than 27th in competing with the hybrids.

After these tests, research specialists at Kansas State University say: "Planting anything but hybrid seed for sorghum grain production should no longer be considered."



Quackgrass cover on Frazier's orchard.

In Illinois tests, hybrid grain sorghums outyielded standard sorghum varieties by 44 percent. Yields up to 115 bushels per acre were recorded for some hybrids.



# Conservation Knowledge of Virginia School Pupils

By Robert H. Giles, Jr.

HOW effective is our conservation education program? How much knowledge of conservation are we "getting across"? How can we determine what Virginians know about conservation? Where should we spend most of our time and money in order to teach conservation? These were the questions asked by conservationists and educators that resulted in a two-year research project designed to provide the answers for an effective, efficient Statewide conservation education program.

The study, conducted by the Virginia Cooperative Wildlife Research Unit and myself, under the supervision of Dr. J. S. Lindzey, was possible through the cooperation of the State Board of Education and its staff. The study was limited to the *renewable* natural resources—soil, water, forests, and wildlife.

A test with 100 multiple-response questions was given to 15,443 Virginia public school pupils, both Caucasian and Negro. The questions were designed simply to test their knowledge of conservation. The pupils were statistically selected as representative of the pupils in grades six through twelve.

The test designed for use in Virginia was similar to five tests that had been given in other parts of the United States since 1939. Mean

total test scores did not vary widely, and tended to substantiate the findings of the Virginia study.

Multiple-response "questions" phrased as incomplete statements were prepared from a list of the principles of conservation prepared by myself and the Virginia Cooperative Wildlife Research Unit. The test went through more than four reproductions and a preliminary testing before the final form was printed for the testing program.

Items and test sections were arranged according to difficulty; items were discarded that were considered too difficult or too easy; distractors were arranged at random; vocabulary was slanted at

the sixth grade reading level.

Many studies indicated that the test had high validity and reliability; i.e., it did test for pupils' knowledge of the principles of conservation and it was consistent in its measurement of this knowledge. A correlation test made with pupil I.Q. scores indicated that the scores did not result from pupils' abilities to read or to reason out the answers but their possession of, or lack of, knowledge of the principles of conservation.

In 1956 Virginia had over 314,000 pupils in its public schools in grades six through twelve. Twenty-three percent of these pupils were Negroes. Of the schools having grades 6 through 12, there were 1,338 for Caucasians, 660 for Negroes. Indian schools were not included in the study. Of the 69 schools selected, 61 participated, administering the tests to the 15,443 pupils.

One of the outstanding results of the study was the differences detected in scores made by pupils living in different community areas. Suburban pupils obtained higher scores than did town, large city, or farm pupils, in that order (59.4, 55.6, and 51.4). The lower scores by rural pupils is surprising because of the apparent abundance of conservation education among agricultural people. The results indicate that suburban pupils have a greater knowledge of the principles of conservation than do rural pupils, and may reflect in rural



Robert H. Giles, Jr.

Note:—This article was prepared for SOIL CONSERVATION by the Virginia Cooperative Wildlife Research Unit. The study referred to was financed by the Wildlife Management Institute.

education overspecialization and emphasis on agricultural methods and techniques rather than on principles.

The tests indicate that the pupils have more knowledge about the principles of forest conservation than about soil and water conservation, and know least about wildlife conservation of all the resource fields tested.

Increase in test scores by school grades was not constant. The greatest increase occurred between grades 8 and 9, next greatest between 7 and 8, and least increase between grades 11 and 12.

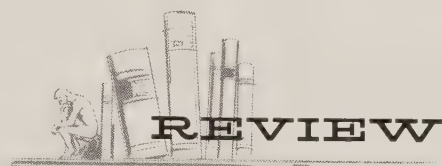
The three most beneficial school courses, in order, were: general science, biology, and geography. Beneficial school courses participated in by the greatest number of pupils were: general science, geography, and history. This information will help determine where conservation can be most efficiently and effectively taught.

The three most beneficial non-school activities, in order, were: Boy and Girl Scouts, summer camps, and a family interest in nature and conservation. Membership and participation was greatest in the Boy and Girl Scouts, summer camps, and the 4-H Clubs. Thus, scouting and summer camps were shown to be effective as well as contacting a great number of pupils. The answer to the resource agencies' question, "Where can we best spend our time and money to teach conservation?" may lie in these results.

Pupils indicated that reading sportsmen's magazines, watching movies and slides, and reading books on nature and conservation were most helpful in taking the test (in that order). The three helpful activities in which most pupils participated were: watching television, watching movies and

slides, and reading newspapers.

Where in the school can conservation be most efficiently taught? Considering that: (1) Pupils in grades 1 through 6 have limited abilities for comprehending conservation; (2) pupil dropout in the public schools is continuous, but is accelerated between the sixth and seventh grades; and (3) greatest increases in pupils' scores occurred between grades 7 and 9, I conclude that conservation can be taught most efficiently and effectively in grades 7, 8, and 9. If one grade is to be selected, grade 7 appears to present the greatest opportunities.



**THIS LAND OF OURS.** By Alice Harvey Hubbard. 272 pp. 1960. Macmillan Company: New York. \$4.95.

**T**HIS book is by a prominent garden club and civic club leader and is directed mainly to garden clubs, women's clubs, and civic groups about the parts they may play in keeping America beautiful and in conserving our natural resources.

The author uses specific cases of community, group, and individual projects to encourage others to "do what you can, where you are, with what you've got." And she is very persuasive. It will be difficult for anyone to read this book without wanting to rush out and get some kind of conservation or landscape beautification project started.

More than 180 projects are discussed in detail. The discussion includes how: A North Carolina community started its land improvement program by holding a mail-

box-painting contest; the women of Hawaii eliminated billboards from their scenic highways mainly by putting pressure on the advertisers; the members of a garden club in Texas got a soil conservation district organized by pressuring their husbands and neighbors, who previously had voted it down; and so on.

This book is unique in its approach and is both interesting and readable. Let's hope it is read, discussed, and reviewed by many of the Nation's garden clubs and women's clubs. If it is it should exert a profound influence on the sight and shape of the landscape in the future. It should also be interesting and thought-provoking reading for men and teenagers.

—TOM DALE

**GRASSES IN AGRICULTURE.** By R. D. Whyte, T. R. G. Moir, and J. P. Cooper. FAO Agricultural Studies No. 42. 418 pp. Illus. 1959. Food and Agriculture Organization of the United Nations: Rome. \$4.

**T**HIS 417-page FAO publication authored by three prominent British authorities treats a broad subject from a worldwide point of view.

It begins in Part I with the agronomy of grasses, treating such subjects as: economic advantages; factors which limit grassland farming; soil fertility; establishment, management, and utilization of sown pastures; the use of dung, urine, and artificial fertilizers; the management of irrigated pastures; the feeding value of pastures and grasses in the tropics; production and distribution of seed; and procedures and designs in grassland research.

Part II is devoted to the biology of forage plants. It reviews the



CHANGE OF ADDRESS SHOULD INCLUDE ZONE, OLD ADDRESS, AND CODE NUMBER

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bioclimatic environment in which plants grow and attempts to map the distribution of the major tribes of the Gramineae. Grasses are described with respect to their adaptation to their environment and are then classified according to their major zones of distribution. Thirty pages are devoted to plant introduction, selection, and breeding.

Part III describes the distribution, agricultural value, and agronomy of 166 grasses. In this group are many native North American species including a considerable number that have been domesticated and brought into agricultural use by the Soil Conservation Service during the last 25 years.

The 560 well-chosen references and literature citations furnish opportunity for wider reading and study. Much of the technical subject matter is clearly presented in the 65 neatly arranged tables. Other data are well presented in 23 figures consisting of graphs, diagrams, charts, and distribution maps.

This book is especially valuable to the specialist for gaining wider knowledge of grasses from all points of view—whether taxonomic, ecological, agronomic, or physiological. The authors have concerned themselves mainly with the principal areas of the subject, drawing upon a wide field of practical knowledge to illustrate the points of discus-

sion. For detailed and more specific knowledge concerning the solution of local farm problems one would need to turn to local floras and literature.

—A. D. STOESZ

### ***A new paper mulch for gardens and truck farms***

A new type of paper mulch for gardens and truck crops has been tested for two years at the University of Illinois experiment station with promising results. The improved kraft paper contains a fungicide that keeps the paper from breaking down before the growing season ends. This previously was paper mulching's biggest drawback.

The Illinois tests were made on cucumbers, with plastic-mulched and ordinary cultivated plots included in the experiment. All mulched plots significantly out-yielded the cultivated plots both years.

Plastic and paper mulches offer several benefits. They effectively control weeds, conserve water, keep fruits clean, help warm up the soil in the spring, prevent soil nutrients from leaching, and keep the soil in good physical condition. And they can be laid on a field with a tractor-attached applicator.

The new paper mulch has two advantages over the plastic mulch. First, it costs less. Second, it's easier to dispose of. The paper mulch can be plowed under with ordinary farm implements without interference to following crops. Plastic mulches must be removed

from the ground after their useful period is over.

Paper's main disadvantage is that it tears easily. The Illinois testers found, however, that tearing was infrequent if the paper was laid carefully over a smooth seedbed.

### ***A Special Grass Seeder for Western Ranges***

The Oregon State College experiment station announces that a special grass seeder has been developed there that may revolutionize seeding on rough rangelands and cut-over forest lands. In tests on Oregon range the seeder has given faster sprouting, 2 to 3 times more survival, and higher yields after grass stands are established than where grass was planted with conventional equipment.

The wide wheels on the special seeder use its great weight to pack the soil to make a firm seedbed, and at the same time open small seed furrows in the packed soil. Seed is dropped in the furrows, and covered with loose soil by heavy drag links. The machine has operated successfully on rough land covered with brush, stubble, and rocks.

Further refinements are now being made on the special seeder at the U.S. Forest Service equipment center at Arcadia, Calif.



A recent survey by a group of Federal agencies disclosed the fact that hundreds of rural communities share the same problem as depressed urban areas—too much labor for the jobs available.



JULY 1960

# Soil Conservation





*Our lands . . . were originally very good; but use and abuse have made them quite otherwise . . . We ruin the lands that are already cleared, and either cut down more wood, if we have it, or emigrate into the Western country.*

—GEORGE WASHINGTON

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**COVER PICTURE.**—Contour strips of corn and meadow on the farm of a cooperator with the Coshocton County Soil Conservation District, Ohio.

# Soil Conservation

**EZRA TAFT BENSON**  
Secretary of Agriculture

**DONALD A. WILLIAMS**  
Administrator, Soil Conservation Service

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# Harvesting a Double Crop

with Their Conservation Information Program

By Ed Livermore

**T**HE OPA-SCD Conservation Information Program—sponsored jointly by the Oklahoma Press Association and the Oklahoma Association of Soil and Water Conservation Districts—is producing a double crop: a previously unharvested crop of dollars for newspaper publishers, and an unprecedented harvest of soil conservation practices on the land for Oklahoma farmers.

It was Leon J. "T-Bone" McDonald, assistant State conservationist, Soil Conservation Service, who conceived the idea that soil conservation districts, newspaper publishers, and "mainstreet" would make an unbeatable combination: The districts because soil conservation is a commodity they have for sale; newspaper publishers because they are in the advertising business; and "mainstreet" because the merchants believe in the district's commodity, and prosperity is their business.

The competition is keen between soil conservation districts in trying to win one of the coveted plaques presented by the press association. This is mainly because many district leaders feel that the conservation information program is a good gauge of the interest and accomplishments in soil and water conservation work. In many districts the local publishers meet with the supervisors and help develop an information program "tailor-made"

to meet the needs of the area.

Full-page advertisements featuring soil conservation practices and events appear to be the most popular item of the eight-point program. In 1959, 93 of the State's 275 newspapers published full-page spreads featuring some conservation activity.

These ads, sponsored by business firms, are designed to get more conservation in the minds and hearts of the people and on the land. More and more publishers are obtaining sponsors on an annual basis. Where this is done, full-page spreads are published monthly and bring in from \$750 to \$1,500 annually to the publisher.

Newspaper publishers over the entire State feel as did the State President of OPA when he presented plaques to winners at the annual meeting of OASWCD early

this year. He said: "Any proceedings that we can take part in which are aimed at conserving our two most important resources—soil and water—are certainly worthwhile, and a pleasure." The publishers have an added feeling of appreciation for this information program in that they are harvesting a brand new crop of dollars in furthering this endeavor.

Lavern Fishel, president of the OASWCD, pointed out to supervisors of Oklahoma's 87 soil conservation districts that "the local newspapers and business men are among the most important resources available locally to help get the conservation job done. We should give business men an opportunity to identify themselves with our soil and water conservation program."

Several districts have found it



F. S. Hurd (left), oldest SCD supervisor in Oklahoma, accepting award plaque for his district from Ed Livermore, while Lavern Fishel (right), president of OASWCD, looks on.

Note:—The author is publisher of the *Sapulpa Herald*, Sapulpa, Okla., and is president of the Oklahoma Press Association.



both enjoyable and helpful to give "appreciation dinners" annually to business men who have sponsored ads during the year. At these dinners, accomplishments of the year are considered and plans are made for the year ahead. This type of cooperation makes for effective teamwork.

The genuine merit of the program is written on the pages of Oklahoma's soil. In Western Kay County SCD—after a year of organized publicity and a full-page spread published on a monthly basis—results showed increases of 145 percent in referrals received, 64 percent in ponds built, 108 percent in waterways built, and 215 percent in waterways sodded. In miles of terraces built, there was a 78-percent increase, and in miles of diversions 167 percent, while miles of drainage increased 250 percent.

In Noble County, where a similar publicity program had been carried on, results have been equally gratifying. Range seeding showed an

increase of 61 percent over the preceding year, pasture sprigging was stepped up 125 percent, and pasture planting increased 594 percent, while proper use of range and pasture showed an increase of 75 percent.



SCS technicians discussing a group of full-page spreads on conservation that appeared in Rogers County newspapers.

These tangible benefits can be added up and give concrete evidence of the merits of a good information program. Possibly the greatest benefit has come, however, in a field that cannot be totaled on an adding machine. That is the field of good will—the field of joint accomplishment on a job for the common good.

Noble County SCD says, "The civic clubs, Chamber of Commerce, schools, churches, and other organizations have a better understanding of the district's objectives, and are more cooperative as a result of full-page spreads. These ads have improved the district's relations with the local newspaper. The publisher is eager to print district news items, benefit stories, and the activities of watershed groups."

While the use of full-page spreads has shown the most phenomenal growth, there are other facets to the conservation information program. Recognition is



From left: Walter William, supervisor, Checotah SCD; Foster Tripp, supervisor, Western Kay County SCD; Edward Johnson, supervisor, Noble County SCD; Nonnearl Zimmerman, clerk, Okmulgee County SCD; F. S. Hurd, supervisor, Arkansas-Verdigris SCD; and Ed Livermore, president, Oklahoma Press Association, display the plaques won by the SCD's in the 5 groups of the OPA-SCD Conservation Information Program.

given at the annual meeting of OASWCD to the districts who chalk up the heaviest score by the following standards: A conservation picture, or newspaper mat, with outline is worth 75 points; a conservation story without picture or mat will earn 100 points, while the same story with picture or mat is worth 150 points. A district story written by someone other than district personnel will earn 200 points. A conservation editorial will earn 300 points, a full-page spread featuring some phase of the district's activities will bring 400 points, and a special conservation edition earns 500 points.

All districts are rated by the

same measuring stick, but districts are classified according to the number of newspapers published within the district: those with only one newspaper; those with two; three; four; and those with five or more. In that way, each district is judged in comparison with other districts having the same newspaper facilities.

Scrapbooks for posting clippings are furnished by the State Soil Conservation Board. Neatness, originality, and artistic arrangement are considered in judging the scrapbooks on a comparative basis.

The first annual program proved its merits in 1958. Yet, participation practically doubled in 1959. Using the best "yardstick" avail-

able in arriving at results of the second year's work, it was found there had been approximately 5,250 items published, covering an estimated 110,150 column-inches, with around 85 editorials and 325 full-page spreads featuring the district's soil conservation program and activities.

This type of program does not have to be sold—to districts or to publishers—it sells itself. This crop of dollars and exceptional crop of conservation practices on the land can be harvested in any State when the State Press Association teams up with the State Association of Districts. We will be glad to give you the benefit of our experiences here in Oklahoma.

## NITROGEN FERTILIZATION OF HOT CLIMATE GRASSES

By Jose Vicente-Chandler and Robert W. Pearson

THE yield potential of grasses in the tropics is much greater than in temperate regions because of the year-round growing season. For example, intensively managed grasses in hot climates can yield over twice as much forage as the highest yields of Coastal Bermuda-grass in the Southeastern United States. If this potential is to be exploited, however, heavy fertilization, especially with nitrogen, is necessary. The requirements and problems of nitrogen fertilization of hot-climate grasses are much like those of temperate regions except that they are magnified.

In spite of the tremendous possibilities for production, progress in improved pastures has been slow

in most tropical areas. Frequently, pastures consist of the native vegetation that volunteers on resting cropland, providing little feed of low value.

The results presented here are from experiments carried out in Puerto Rico where the mean annual temperature is about 75°F with a maximum average monthly variation of only 10°. Maximum day-length variation is less than two hours during the year and rainfall is about 75 inches yearly.

Napiergrass (*Pennisetum purpureum*), Guineagrass (*Panicum maximum*), Paragrass (*Panicum purpurascens*), and molassesgrass (*Melinis minutiflora*) are among the most widely used grasses of the humid tropics. In recent years pangolagrass (*Digitaria decumbens*) has shown promise of becoming an important addition. Despite

the importance of these grasses, only during the past few years have their fertilization requirements for intensive forage production in the humid tropics been studied.

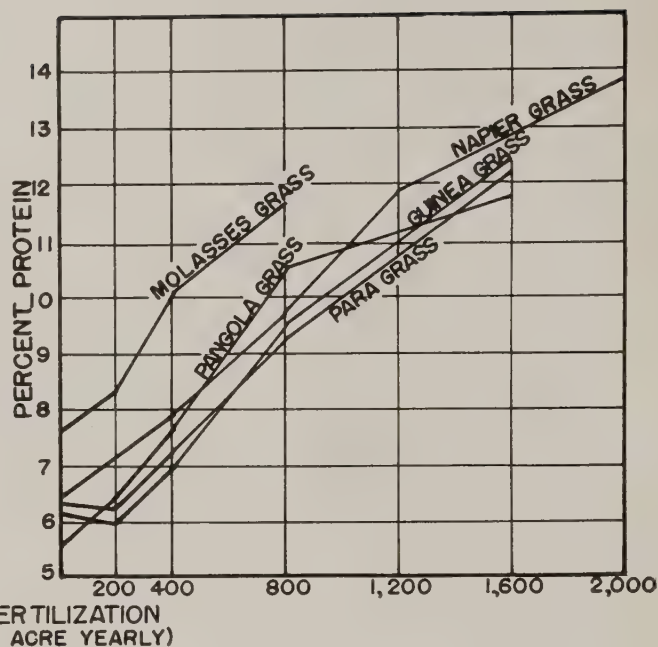
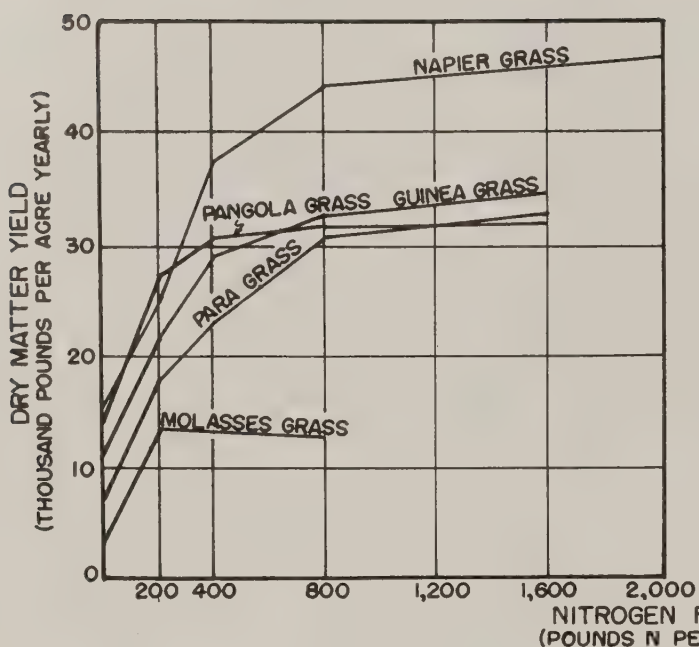
Results from three-year experiments on these 5 grasses in Puerto Rico are shown in the graph on the following page. Nitrogen rates varied from 0 to 1,600 pounds per acre annually while other nutrients were supplied at a constant, high level.

### No. 56

This is the fifty-sixth of a series of articles to appear from time to time in explanation of the various phases of research being conducted by the Department of Agriculture on problems of soil and water conservation.

Note:—The authors are soil scientists, Agricultural Research Service, Rio Piedras, Puerto Rico and Beltsville, Maryland, respectively. This work was done in cooperation with the Puerto Rico Agricultural Experiment Station.





Napiergrass has consistently shown the highest yield potential of the five grasses studied, and the largest response to nitrogen fertilization. This grass yielded 7½ tons of dry forage without nitrogen, but nearly 3 times as much when 800 pounds of nitrogen was applied. The fertilized grass produced 130 tons of green forage, enough to feed about 6 cows per acre. Molassesgrass, on

the other hand, had a very low yield potential, producing a maximum yield of around six tons of dry matter. Its yield was not increased by applying more than 200 pounds of nitrogen. The other grasses showed strong yield increases up to 400- or 800-pound applications of nitrogen.

Forage composition was markedly affected by nitrogen fertilization. The protein content of all

the grasses increased sharply with nitrogen rates up to the highest level tested. Only traces of nitrate nitrogen were found in the forage even at the 2,000-pound rate of nitrogen fertilization. In these experiments the phosphorus content of the forage decreased slightly and lignin increased somewhat with nitrogen fertilization.

Even with the best management, including splitting the fertilizer into six applications annually, only about one-half of the applied nitrogen was recovered in the forage. This is in line with poor recoveries found for Coastal Bermudagrass at high rates of nitrogen application in the Southeastern United States.

Other experiments evaluated nitrogen fertilization in terms of animal gains. In one such experiment Napiergrass grown on a steep mountain slope with different rates of nitrogen was grazed. With 100 pounds of nitrogen only 580 pounds of beef were produced per acre annually compared to 1,300 pounds of beef at the 300-pound nitrogen rate. In this experiment no in-



A Puerto Rico pasture that carries about 1 cow to 8 acres in a land where there is only 1 acre per person.



crease in beef was made by increasing nitrogen rates to 500 pounds per acre.

As with most improved practices, the use of high nitrogen rates raised other problems. One of the most serious of these was the residual acidity created in the soil. At high rates of ammonium sources of nitrogen, extreme soil acidity was developed in only two or three years. For example, the application of 800 pounds of nitrogen per acre, as ammonium sulfate, for 2½ years in one experiment decreased the surface soil pH from 7.0 to 5.2 and the effect extended into the subsoil. More than five tons of limestone were required to restore this soil to its original level of bases. When ammonium nitrate or urea was used there was a similar but less drastic acid effect. With sodium nitrate, however, there was no appreciable decline in soil pH.

Another problem encountered with heavy nitrogen fertilization is burning of the grass. This caused a serious setback in growth, even with multiple splits of the application, where dry weather followed fertilization and where the fertilizer was applied directly on the clumps of grass.

Nitrogen fertilization also can change the species composition of pastures. When molassesgrass pastures are fertilized, for example, higher yielding grasses with more exacting fertility requirements such as Para, Guinea, and Napier take over.

Many factors influence the effective use of nitrogen by grasses. For example, temperature and variation in daylight—while not nearly as important in the tropics as in temperate regions—affected the growth rate of grasses appreciably.

The yield potential of Napier, Pangola, Guinea, and Para grasses



**Guineagrass in the foreground received no nitrogen fertilizer, while that in the background received about 800 pounds of nitrogen per acre yearly.**

is about one-third less during the somewhat cooler and shorter days of winter. This was true even when moisture and other factors favored maximum growth. The nitrogen response curve tends to level off at about the 400-pound rate during this period, compared to 600-800 pounds during the remainder of the year.

Moisture is the chief climatic factor determining yields and response of grasses to nitrogen in the tropics. Guineagrass, for example, yielded only 6 tons of dry forage and responded to only the 100-pound rate of nitrogen with 35 inches of rainfall. With 80 inches, or with irrigation, this grass yielded about 17 tons and responded to 400-800 pounds of

nitrogen per acre. In this connection it should be recognized that a given amount of rainfall is much less effective in the tropics than in temperate zones, because of the high year-round evaporation rate.

The grasses themselves have different inherent productive capacities. This is reflected in their response to nitrogen, as shown by the preceding graph. Optimum fertilization rates therefore are governed in large measure by the species.

Management practices can strongly affect yields and response of grasses to nitrogen fertilization. Napier, Para, and Pangola grasses yielded about a third more over a two-year period when cut close to the ground every 60 days than when cut to about eight inches. On the other hand, yields of Guinea-grass were unaffected by cutting height, while molassesgrass was killed out by close cutting.

Frequency of cutting also strongly affects forage yields and efficiency of nitrogen fertilizer. Napiergrass receiving 800 pounds of nitrogen produced 12, 22, and 37 tons of dry forage per acre yearly



**This field of heavily fertilized Napiergrass produced enough forage to feed about 8 cows per acre.**





**This Guineagrass pasture, fertilized with 1 ton of 15-5-10 fertilizer per acre yearly, carried 2½ cattle per acre and produced 1,200 pounds of beef per acre yearly.**

when the grass was cut at 40-, 60-, and 90-day intervals, respectively. Quality of the forage decreased with length of harvest interval, however, as evidenced by a lower protein, calcium, and phosphorus content and an increase in lignin.

Whether the grasses are harvested by cutting or grazing also strongly affects yields and response to nitrogen fertilizer. Napier, Guinea, Para, Pangola, and molasses grasses yielded only about half as much with simulated grazing as with cutting management.

Availability of other nutrients often sharply limits the response of grasses to nitrogen. Tremendous quantities of nutrients may be removed from the soil in forage produced by properly managed, heavily fertilized grasses. For example, the forage from one field of heavily fertilized Napiergrass actually contained 670 pounds of nitrogen, 270 pounds of phosphate, 550 pounds of potash, 120 pounds of calcium, and 120 pounds of magnesium per acre.

While we normally expect to provide most of the nitrogen requirements of grasses through fer-

tilization, the initial soil supply of other nutrients usually is depended upon. The very high yields of grasses grown under intensive management in the tropics, however, require a complete reevaluation of the overall fertilization program. In the example cited above the phosphate and potash removed from the soil by Napiergrass in one year are equivalent to over 1,300 pounds of superphosphate and 900 pounds of muriate of potash. At this rate, nutrients are soon depleted in even the most fertile soils. Hence, initial nutrient content of the soil is not a major factor in determining its long-range possibilities for production of intensively managed grasses. Fertilization of high-yielding grasses used for cut feed should generally be based on nutrient withdrawal in the forage with allowances for losses by erosion, leaching, fixation, etc.

Potassium in particular must be carefully considered. The following tabulation shows how strongly potash can affect yields when all other nutrients are provided in abundance.

| Potash applied<br>(lbs. per acre) | Dry forage produced<br>(lbs. per acre) |                    |
|-----------------------------------|----------------------------------------|--------------------|
|                                   | <i>Guineagrass</i>                     | <i>Napiergrass</i> |
| 0                                 | 9,900                                  | 5,000              |
| 200                               | 22,300                                 | 23,600             |
| 400                               | 30,600                                 | 27,800             |
| 800                               | 32,800                                 | 36,400             |

The common sources of nitrogen appear to be about equally efficient in providing this nutrient to tropical grasses. Urea, ammonium sulfate, ammonium nitrate, sodium nitrate, and ammonium hydroxide produced equal yields of Napiergrass of similar protein content.

The number of applications in which a given amount of nitrogen is applied can affect efficiency of use. In one experiment there was no advantage in applying the nitrogen in 12 applications instead of 6 where 6 cuttings were made. Experiments are now underway to determine the effect of less frequent applications of nitrogen on yields and efficiency of nutrient use by grasses.

### **Minimum tillage saves Time and money**

Minimum tillage may help farmers who want to boost their net incomes. R. A. Hinton, agricultural economist at the University of Illinois, figures that farmers using minimum tillage save \$146 to \$159 in operating costs on 100 acres of corn, compared with using conventional tillage.

The fixed investment costs of tractors and machinery would be about the same for both methods, however.

The farmer can also boost his net income by making good use of the time saved by minimum tillage. By producing more livestock or farming more acres he could earn from \$155 to \$172 more net income for each 100 acres of corn.

Figuring labor at \$1 an hour, gains from minimum tillage would total \$301 to \$331 for each 100 acres of corn.

# The Deserts Bloom

—in a Hurry

By Francis M. Roberts

**O**TIS HELSLEY is not waiting to be shown good farming techniques on a Columbia Basin farm near Quincy, Washington. In partnership with his son, Don, he has a conservation plan well underway that is making even the professionals shake their heads in amazement.

Although new to the Columbia Basin, Helsley is far from a novice in irrigation farming. He left his native State of Missouri 30 years ago and moved to the Twin Falls area of southern Idaho, where he learned most of his lessons about irrigation farming.

About 17 years ago Helsley made a trip to the Basin country to size up the opportunities he had heard so much about. "When I saw the land around Quincy, I didn't look any farther," he says. He purchased 160 acres then, but had to wait nearly 10 years before water deliveries were first made in the spring of 1953.

The Helsleys were quick to recognize that although their soil was basically fertile, one deficiency was inherent. Humus, often called the life of fertile soils, was low—as in most areas of low rainfall. Thus one of their main jobs was building up soil humus and fertility.

Farmers on newly-irrigated land often are tempted to grow high-value, soil-depleting crops, such as beans or sugar beets, despite the soil's immediate need for humus

and organic matter. Although "a soil-depleting crop" in conservation terms, sugar beets have a history of stable returns to irrigation farmers. When Helsley sold his farm in Idaho he was not able to transfer his acreage allowance of this controlled crop. Thus, there was no temptation to start with sugar beets. Instead, alfalfa—the oldest and best known of soil-improving plants—became the predominant crop on the Helsley farm.

James H. Hansen, Soil Conservation Service technician at Quincy, says: "We try to persuade farmers on Class I land like Helsley's to have each field in alfalfa at least 25 percent of the time." Hansen admits he often is unsuccessful in this attempt. Farmers getting started are lured by the prospect of greater immediate returns from



Otis Helsley in front of one of his feed bunkers.

other crops. "Hence you can imagine my amazement," Hansen said, "when I discovered that Helsley and his son, Don, had two-thirds of their farm in alfalfa—over 2½ times the recommended minimum."

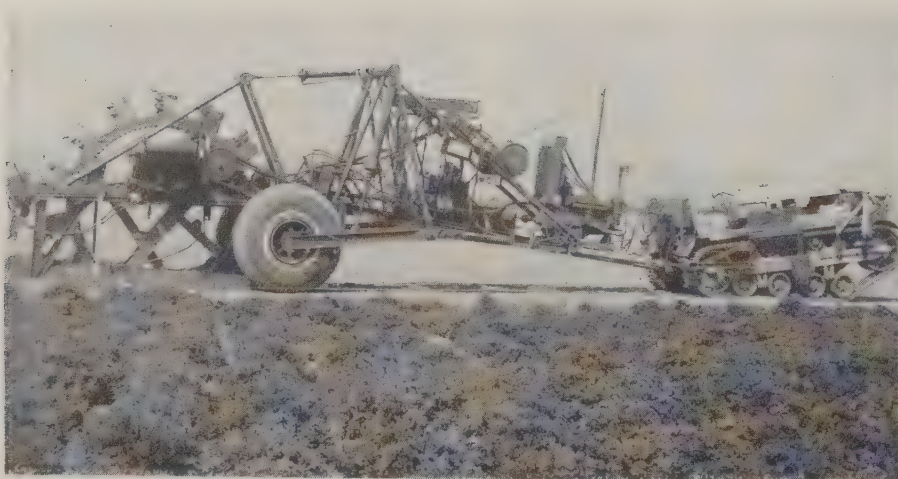
The economics of farming practically dictated another part of the Helsleys' overall plan. Livestock



A finished, concrete-lined irrigation ditch on the Otis Helsley farm.

Note:—The author is civil engineer, Soil Conservation Service, Ephrata, Wash.





A side view of the ditching and trimming machine used on the Helsley farm. Hydraulic controls, activated by mercury contact switches, precisely determine the grade of the ditch.

were needed to use the alfalfa. Three hundred sheep do a pretty good job of this, and alfalfa leaves the farm only in the form of animal products.

While soil building was receiving high priority, physical improvements were not being neglected on the Helsley farm. A modern farm home and other neat farmstead buildings were constructed. Underground concrete pipelines extending nearly three-quarters of a mile in length were installed prior to 1958. This eliminated erosion and reduced the water loss in former earthen ditches.

In the spring of 1958, the Hels-

leys were ready for another bold step. A local contractor had shown them a plan for economically lining open ditches with concrete. The idea was new to this area, but it looked good to Otis Helsley. So, with technical help from SCS technicians working with the Quincy Soil Conservation District, he tackled the job.

Helsley soon discovered that such a project must follow several well-coordinated steps. Before the final step of placing the lining, a considerable amount of preparation was required. The first step was to survey and design the ditch route. SCS technicians gave him

engineering assistance on this. A design was developed and stakes set to guide the construction. "Building a good foundation for the concrete is one of the most important parts of a good lining job," says the SCS engineer at Quincy. On the Helsley job, this important step was not neglected.

With the foundation ready, the next step was to cut and trim the earthen ditch section to precise grade and dimensions. How well this job is done determines how well the ditch will work. The dimensions chosen were modest. A 12-inch bottom width and 16-inch depth with sides sloping so that the width at the top was only a bit over three feet was adequate. A ditch of this size lined with concrete will carry water at a rate of more than three cubic feet per second.

The contractor that Helsley hired for the job had up-to-date equipment. He had a large ditching machine with an automatic trimmer. This machine, which operates like a trencher, cuts and trims the ditch to the exact dimensions chosen. True grade is obtained by the ingenious use of hydraulic controls activated by electrical contacts.

With the earthen ditches accurately cut, the liner, or "slip-form" as it is referred to by the contractors, is placed in a ditch and the magic of concrete lining begins.

A large crawler tractor pulls the slip-form along the preshaped earthen ditch. Premix-concrete trucks discharge freshly-mixed concrete into the hopper of the liner. As the liner is pulled forward, the concrete flows into the bottom and sides of the ditch. Steel surfaces shape and form the fresh concrete against the walls and bottom of the channel to a predetermined thickness, usually about two inches.

The fresh concrete must be just the right consistency for a good job.



The ditching and trimming machine accurately shapes the ditch to be lined with concrete.





Ditch lining on the Helsley farm proceeds at a rapid pace. The tractor in the background pulls the slip-form. The pre-mix concrete truck at the left pours concrete into the slip-form, while men in the foreground finish the shaping with trowels. The water truck at the right moistens the earth in the ditch prior to lining.

It can't be too dry or the lining will be rough and porous. If it is too wet, the sides will slump into the bottom.

Once everything is set, the operation proceeds at astonishing speed. In a matter of a few hours several thousand feet of lining can be placed. The last operation is to trowel expansion grooves and spray the surface with a sealing membrane which prevents the new concrete from drying too rapidly.

After a season of use, Helsley is enthusiastic as he describes the merits of his investment. "I believe the concrete ditch linings reduce my irrigation costs by half, mostly in labor savings. They also save water, and weeds on the ditch banks are no longer a problem," Helsley says. To further emphasize how he feels, another 3,000 feet is planned.

The contractor's price for the lining was \$1.25 per linear foot. This price did not include grading the foundation, which varies con-

siderably with each job. By cooperating with the ACP, cost-sharing payments of about 50 percent of the entire cost were available after the job was finished.

In six short years the Helsleys have made enviable progress in turning essentially desert land into a beautiful irrigated farm. The pattern they have set undoubtedly will have widespread influence in this new community.

### ***Dairy heifers don't like unwilted silage***

Dairy heifers ate sparingly and grew slowly when fed silage made from freshly chopped, unwilted grass-legume mixtures at the USDA Experiment Station, Beltsville, Md. This presumably was because some unidentified organic compound formed during the fermentation of the silage decreased the appetite of the animals. The unwilted silage also affected the appetite of mature cows, causing a decrease in milk production, but the effects were more marked in the growing heifers.

### ***Soil tests show important deficiencies***

The value of soil tests was proved in Marion County, Ore., recently when a cooperative mass sampling revealed several reasons why crops in that area aren't growing as well as they should.

Soils on 66 farms within a 7-mile radius of Stayton were tested as a cooperative effort of Oregon State College, fertilizer dealers, and a canning company. Soil samples were analyzed in the OSC soil testing laboratory. The mass testing was initiated by the canning cooperative, which felt that growers could improve production of some crops—especially sweet corn.

Too little boron was found in 209 of the 228 soil samples taken. Of these, 158 were critically low.

Forty-four samples were low in phosphorus, 24 critically low. But 75 samples were high, which reflects an excessively heavy use of phosphorus fertilizer by some farmers.

As for potash, 90 samples were below the level considered adequate for most crops.

The tests uncovered a shortage of magnesium in 15 samples. This was the first indication of magnesium shortages in the main Willamette Valley.

Taking many samples in a concentrated area provided good opportunity to compare soils and see what shortages were present in the area. Similar cooperative operations are underway near Gresham and Eugene.



The application of a few ounces of molybdenum per acre more than doubled average alfalfa yields in Georgia Experiment Station tests. The researchers say that one of the apparent functions of the molybdenum is nitrogen fixation in the soil—the molybdenum-treated alfalfa was greener and higher in nitrogen content than the untreated alfalfa.



In 1959 U.S. farms had 4¾ million tractors.





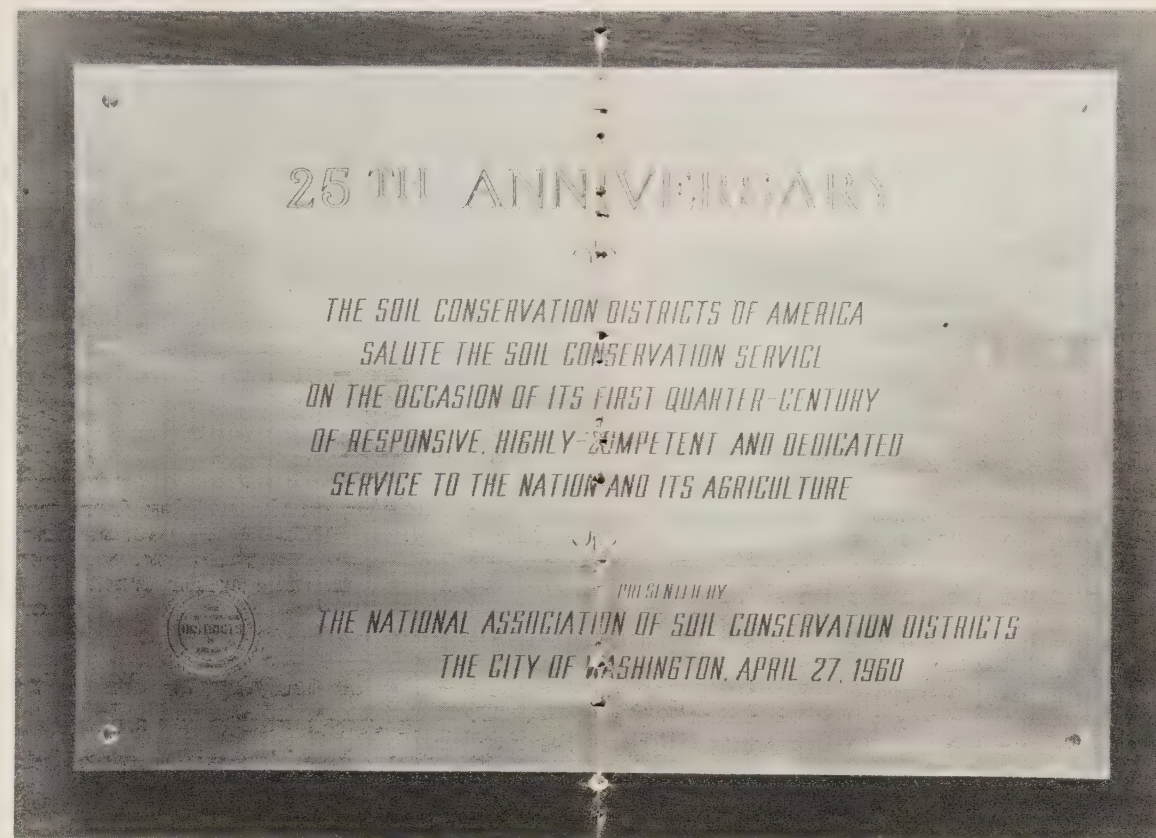


# SCS Celebrates Its Silver Anniversary

WITH soil conservation districts in the lead, many individuals and organizations throughout the country helped observe the 25th anniversary of the Soil Conservation Service.

The climax of a week-long expression of congratulations and good will came at a banquet in Washington, D. C., on May 4, sponsored by the National Association of Soil Conservation Districts. It was there, in the National Press Club, that William E. Richards, president of the NASCD, presented to Donald A. Williams, SCS Administrator, a handsome brass plaque (shown at the right).

Assembled for the banquet and presentation were 300 notables, SCS employees, and former employees. Forty members of Congress who had helped pass the original soil conservation act on April 27, 1935, and who are still in the Congress, were invited and several of these were able to attend. Bill Richards acted as master of ceremonies. Principal speakers at the celebration were: Senator Allen J. Ellender of Louisiana, Chair-

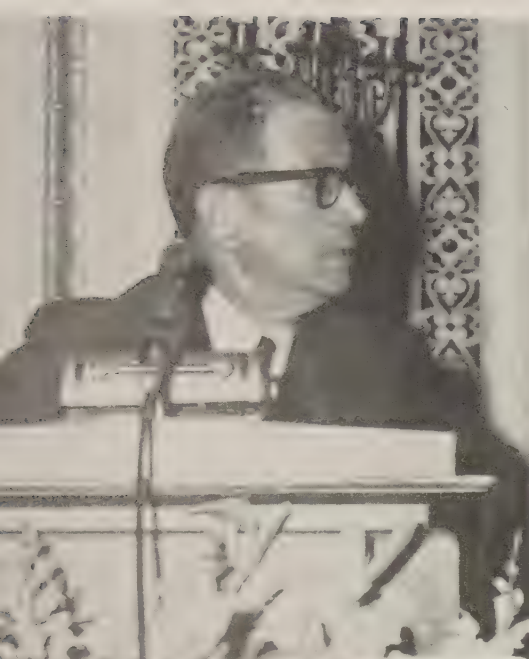


**Pictures:** (upper left) Senator Ellender addressing banquet audience at National Press Club in Washington; (left center) Congressman Jensen addressing banquet audience; (lower left) banqueters with Bill Richards presiding as emcee; (lower center) Richards presenting plaque to D. A. Williams, SCS Administrator; (lower right) Judge Marvin Jones talks about old times to Dr. and Mrs. H. H. Bennett; (right center) Assistant Secretary Peterson addressing banquet audience; (upper right) Vice President Nixon congratulates Gladwin Young, Deputy Administrator of SCS, on the SCS silver anniversary.

man of the Senate Committee on Agriculture and Forestry; Congressman Ben F. Jensen of Iowa; Judge Marvin Jones of Washington, D. C.; Hugh H. Bennett of Falls Church, Virginia; and Ervin L. Peterson, Assistant Secretary of Agriculture.

In addition to the plaque presentation, Gilbert Cox, vice president of NASCD, introduced all SCS employees present who were with the Service on April 27, 1935, and promised that NASCD would mail a certificate of commendation to each of them and to all other SCS employees who have the distinction of having been with the Service throughout its first quarter-century of existence.

Both Senator Ellender and Congressman Jensen were warm in their praise of the Service and soil conservation districts, while pointing up the importance of the soil conservation program of the past 25 years. Judge Jones, who was chairman of the House Agriculture Committee at the time Public 46 was passed, reminisced about the legislative problems involved in





getting this first soil conservation act passed by Congress. Dr. Bennett, the first Chief of the Service, told about early problems and hardships encountered in getting the Nation's soil conservation program underway. Assistant Secretary Peterson gave high praise to SCS and its employees and to soil conservation districts and other conservation organizations that have helped make the present conservation program of the Nation a reality.

Earlier, Senator Ellender, speaking on the floor of the Senate, said: "... Dedicated public servants of the Soil Conservation Service have successfully changed the attitude of millions of people about the need for conserving our land and water resources."

In commenting on districts, Ellender stated: "The growth of the soil conservation district movement in the United States is one of the phenomenal developments of the past quarter century. . . . In my mind, this represents the most successful experiment in agricultural democracy in the history of the United States."

Congressman Jensen, who also spoke on this subject on the floor of the House, opened his remarks by stating: "... this 25th birthday is extra special. It marks that important first quarter of a century for one of the greatest and most successful undertakings in the history of this country—our national soil and water conservation program—as well as for one of the most efficient and effective agencies of the Government we have ever had—the Soil Conservation Service."

In praising the soil conservation districts' participation in the national program, Jensen said: "You soil conservation districts before long will be celebrating your own

25th anniversary as the local, democratic organizations which have made it possible for the soil and water conservation program to move ahead in the splendid way it has. That was another red letter year when, in 1937, 22 States started the procession of States enacting laws enabling landowners and operators to set up their own legally constituted soil conservation districts."

The Iowa Congressman closed his remarks by stating, "Soil conservation has done more to save the American way of life than any other thing we have done since Revolutionary days."

Dr. Bennett, in reminiscing about some of the early problems and hardships in getting the soil conservation program underway, gave credit to rank-and-file employees of the Service for helping overcome some of the obstacles. In this connection, he said: "Our agency was characterized by its enthusiasm, an *esprit de corps*. That helped in countless ways. Clocks and regulatory hours were put aside for getting the job done."

All speakers at the banquet lauded "Chief" Bennett and his early work as the "father of soil conservation."

For a week or more before the NASCD banquet, editorial writers, columnists, reporters, and speakers throughout the Nation had been pointing up the significance of the "silver anniversary" of the soil conservation program and the Soil Conservation Service.

For example, an editorial in the Minneapolis Tribune concluded: "SCS has stood, in all its 25 years, for the conservation of all natural values and thus has helped conserve human values. Few Government agencies have attracted such dedicated personnel or returned so large a dividend on the dollar in-

vested."

Secretary of Agriculture Ezra Taft Benson, in a press release, stated: "Soil and water conservation has made more progress in the last 25 years than in all the years back to colonial times."

He pointed out that although the Department of Agriculture has expanded and strengthened its conservation activities in recent years "the major credit for the outstanding progress belongs to the Nation's farmers and ranchers and to their locally-controlled soil conservation districts operating under State laws."

On the floor of Congress, Representative Bob Poage of Texas said, "I am confident that April 27, 1935, will be recorded as a turning point in the history of American agriculture, and world agriculture."

Senator James E. Murray of Montana commended SCS for "25 years of notable accomplishments." And of districts, he said: "Soil conservation districts . . . are changing the landscape of America into a pattern of utility and beauty."

Congressman Harold D. Cooley of South Carolina joined in the tribute to the Service by saying, "SCS is the evangelist of the gospel of the conservation of our most vital resources—soil and water. Through its leadership we not only are blessed with abundance of food and fiber in our time, but we also are bequeathing plenteousness of the land to the generations to follow us."

Senator Milton R. Young of North Dakota praised the Service on its 25th birthday, and of districts, said: "I should also like to pay my respects to another organization . . . the National Association of Soil Conservation Districts and the 14,000 soil conservation district supervisors . . . These dis-

tricts, as local units of government, are doing a tremendous job in soil and water conservation."

In commenting on SCS accomplishments, Senator Hubert Humphrey of Minnesota said: "The Soil Conservation Service has drawn into its ranks a corps of competent, scientific, dedicated public servants who have championed the cause of preserving America's natural heritage."

Senator Stuart Symington of Missouri noted the "silver anniversary" and said: "One of the main reasons the Soil Conservation Service has been able to build such an impressive record is because of the traditional democratic approach of local leadership and control. The individual farmers have the opportunity to join together in forming their local soil conservation districts. After this, the Federal Government steps in to help. . ."

Vice President Richard M. Nixon extended congratulations to the Service and soil conservation districts at a special meeting held in his office for that purpose on April 27. In discussing progress of the conservation program with Gladwin Young, deputy administrator of SCS, he credited the Soil Conservation Service and soil conservation districts with having helped to establish conservation as an integral part of modern scientific farming. He expressed pleasure over the interest and support given by farm and city people alike to the soil conservation program.

And so it went, not just in the halls of Congress and in the banquet room at Washington, but throughout the country, wherever conservationists congregated or editorial writers commented on the importance of the 25-year-old soil

conservation movement. Practically all SCS employees, former employees, and well-wishers were a bit prouder of their parts in the 25 years of progress as a result of the "silver anniversary" celebrations.

D. A. Williams, administrator, summed up the reaction of SCS employees when he told Bill Richards and the audience at the Na-

tional Press Club as he accepted the NASCD plaque:

"Tonight's observance is a proud moment for me, and I know it is for all SCS and ex-SCS people. . . . Thank you, Mr. Richards, and thanks to all the soil conservation districts and their dedicated leaders, without whom the accomplishments of these 25 eventful years would not have been so great."

# Ten Thousand Plants and a Man

By Robert J. Olson

**L**ENGTHENING shadows of a long summer day in the Palouse country often silhouette a lone figure on a tractor heading toward the sheds. This isn't a man working by the hour or for profits

from his fields, but a man devoted to his job and seeing that it is well done. It is Ward Baird, farm superintendent at the SCS Plant Materials Center at Pullman, Washington. Baird's hours are those he feels are needed to seed the fields, cultivate the stands, and harvest the seed of new and un-

Note:—The author is the former Superintendent, Plant Materials Center, Soil Conservation Service, Pullman, Wash.



Ward Baird heading back to the sheds after seeding another field of grass.





Field hands removing all "off-type" plants from a grass seed production field at the SCS Plant Materials Center.

known plants that may find an important place in conservation farming and ranching in the Pacific Northwest.

As farm superintendent at the Center, Ward has found that this is not an ordinary job of farming where one, two, or maybe three different crops are grown. This is a 320-acre farm where there are

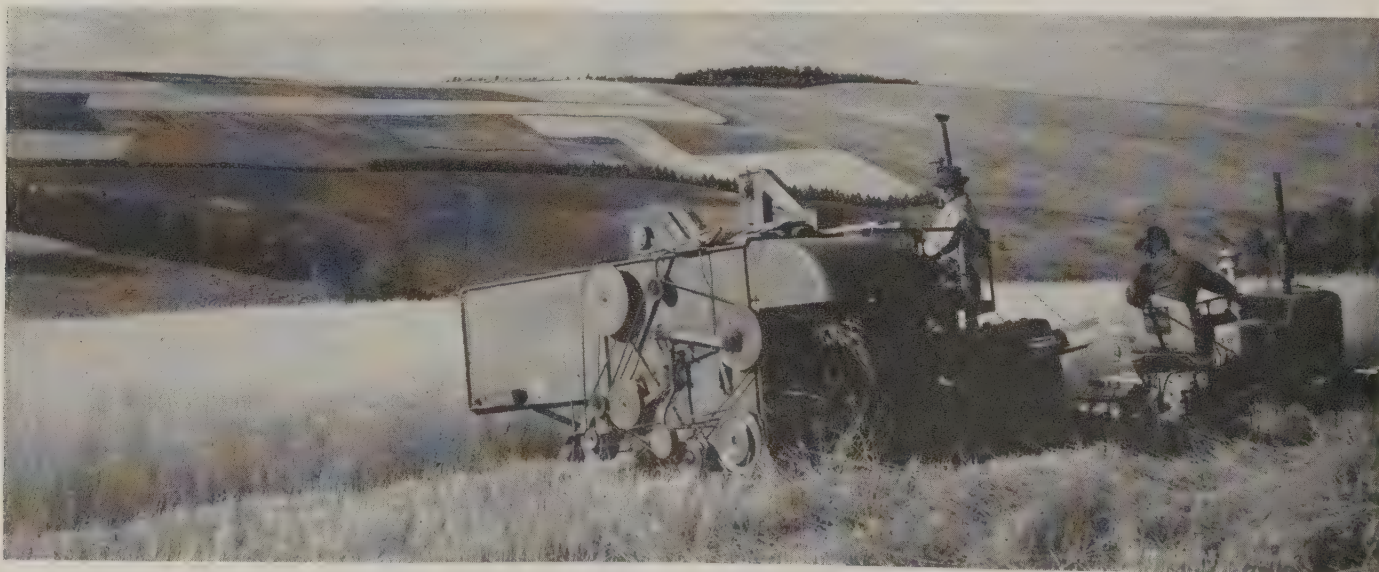
often 25 different fields of grasses and legumes being raised for seed, and hundreds of plots where new grasses, legumes, trees, and shrubs are being tested.

The Center has been responsible for many new plants now used by conservation-minded farmers of the Northwest. Manchar smooth brome-grass, Greenar intermediate wheat-

grass, Whitmar beardless wheat-grass, Latar orchardgrass, and Alkar tall wheatgrass are but a few of the many grasses developed there.

It is rewarding work for a dedicated man like Baird—to see a new plant show promise in a short, single row when it first comes from one of the four corners of the earth; then to watch it grow in stature as it is tested, compared, and evaluated with thousands of others until it proves to be the one plant that is needed for certain problem lands or soils in the Northwest. Then comes the increase of seed supplies so that pure seed will be available for seedgrowers who want to put it into commercial channels to meet the demands of those who want this new plant for their land.

Growing these many different grasses and legumes requires a special knack or ability in everything that is done. Seedbed preparation is a good example. Grass seedlings are small and weak. They must be given every chance for success. This means that the ground must be free of weeds and packed hard with a light cloddy surface on top. The seed has to be planted



Combining grass seed on the seed production farm of the SCS Plant Materials Center, Pullman, Wash. Test plots and seed increase blocks of the Center are visible in the center background.





Ward Baird sacking foundation seed of Whitmar beardless wheatgrass at the SCS Plant Materials Center, Pullman, Wash.

at the right depth, one-half inch to one inch, whether it is light and feathery, small as a pinhead, or has a tail as long as a pollywog.

While the techniques of making a seedbed and proper seeding are important, they are of little use if the equipment is not clean and a few of the wrong seeds get into a field. Air blasting and vacuuming as well as jackknives and screwdrivers are used to clean the equipment to get every seed from every crack and fitting. This fear of mixture is always present in every operation at the Center. Each piece of equipment is just as carefully cleaned, whether it is a combine, binder, seed cleaner, or drying floor.

As each field grows and produces seed, it is constantly checked to see that no weeds or stray plants are present. This means that many hours of labor are spent each year as crews go over the individual fields carefully looking for a stray plant that could contaminate the

production of the entire field in one year. These are foundation fields where often one stray seed per pound cannot be tolerated.

When grass seed ripens it does not respect a man's plans or week-ends. Unlike grain, it ripens quickly and shatters rapidly. When more than 20 different grasses and legumes, totaling 20,000 pounds or more, have to be harvested in 45 days, then a man shows his true worth in harvesting. Seldom has much of a seed crop gotten away from Ward Baird, even though fields that were too green one day were starting to shatter two days later.

Most farming operations of this type get a rest or "break" during the winter; but work continues at the Center. These many different lots of seed must be cleaned, sacked, and stored ready for shipment. As

each lot is cleaned, different machines and adjustments are needed. Always the meticulous cleaning goes on after each lot.

Now the seed is ready to be shipped. Since these new materials were developed, tested, and produced at the Center, this is often the only available source of seed. Requests are received from research workers, experiment stations, and growers all over the world who want to test these new materials for their own use.

While these needs are recognized and serviced, the main purpose and function of the Center continues to be to develop new and better plants for conservation use in the soil conservation districts. It is toward this goal that all of the testing and most of the seed produced is used, and the efforts of men like Ward Baird are dedicated.

## Soils Training for Farmers

By J. B. Seago

SEVEN years ago Don Bannister, soil scientist, and Gisli Johannson, work unit conservationist, were wondering how they could get across to the average farmer a better understanding of the soils on his farm. They figured that with a good understanding of his soils, a farmer could make better use of his soil survey map, and thus do a better job of applying soil and water conservation.

In reviewing other soils meetings and tours they noted that they were generalized discussions and did not cover all the information needed for an individual farm.

What about small group meetings, say, of eight to twelve farmers, for discussion of soils on their respective farms? They thought it might work, so they decided to try it.

Their first meeting was held in the work unit office of the Towner Soil Conservation District, Cando, N. Dak. Seven farmers attended and were enthusiastic about what they learned.

The two SCS men were encouraged. They met with four other groups that spring and fall.

Johannson and Bannister discovered that farmers who had been in one of these meetings reported their "discoveries" to their neigh-

Note:—The author is soil scientist, Soil Conservation Service, Fessenden, N. Dak.





**J. B. Seago (right) helps a farmer locate a mapping unit on the soil survey map of his farm at a soils training meeting in the Foster County SCD, N. Dak.**

bors. This interest resulted in more meetings.

The word kept spreading and other work units in the north-central part of the State began using the idea. The same enthusiasm was reported.

"Farmers leave these meetings looking forward to the actual planning of their farms," Larry Bushey, work unit conservationist at McClusky, N. Dak., related. "With a good understanding of their soils, they see how and why conservation will help them with their soil problems. Visits to farmers, even a year after attending a meeting, are centered around the soil map."

The meetings usually are attended by eight farmers and their wives. They are held in the work unit office during the winter months.

The work unit conservationist

selects the cooperators he is to work with on conservation plans and sends each an invitation. The invitation explains the reasons for the meeting and promises it won't last more than an hour and a half.

As each farmer shows up, he is given a folder containing a colored soil survey map of his farm with descriptions of each soil or capability unit.

The soil scientist explains how the survey was made and its purpose. He gives the geological background of the soils, explains capability units and how to interpret symbols and the color scheme on the map.

He then discusses each mapping unit found on the farms. He names each farmer having that unit on his land and helps locate the unit on his map. He outlines major soil, slope, and erosion features. He gives special emphasis to char-

acteristics that indicate need for conservation treatment.

The work unit conservationist explains briefly the work of the soil conservation district and the value of a complete soil and water conservation plan. Problems dealing with vegetative, wildlife, or engineering practices he leaves until later to talk over with each farmer.

Growing interest is readily apparent by this time. The farmers usually are reluctant to call the session to a halt.

Proof of the pudding comes when the work unit conservationist follows up with a planning visit. He nearly always finds each farmer ready to begin his planning job and to make decisions based on the needs of the land. The outcome is a sound soil and water conservation plan, properly applied and maintained by an enthusiastic conservation farmer.



# Out of The Mud

By Robert L. Hillyard

**T**HE Mothers Club of Lucas School two years ago was asking questions about the muddy shoes and boots the children brought home, while residents of the community were talking about gullies on the new school grounds.

"It wasn't a pleasant sight to see the school children wading through mud to get to the new school cafeteria," said C. S. Barger, superintendent of Lucas School.

Mr. Barger and the school janitor are no longer troubled with muddy floors. The eroding slopes are now grassy benches. All this came about because of the cooperation the school board got from the Richland Soil Conservation District, which helped develop a conservation plan for the school grounds. This conservation plan was much the same as had been worked out for many farmers in the school district, but it was tailored to fit the specific problems.

Lucas School didn't always have mud and eroding slopes. Like most other school districts, however, it needed a new elementary building to relieve crowded conditions in the old building. The voters of the district approved the construction of a new elementary building on a 4-acre tract of land at the rear of the old building. The 4 acres lay on a little plateau about 30 feet higher than the original school grounds. A walk leading from the old building with a series of steps up to the new building was in-

stalled.

School board officials were afraid the steep slopes might wash and had the contractor stairstep them. Ridges were placed on the outside of the leveled areas, thus forming a series of bench terraces. Tile drains were installed under the terrace channels to remove surplus water. It soon became apparent that this system was not the whole answer to their problem. Water draining from the new building and the parking areas came down to the terraces, overtopping them and causing gullies to develop. Mud from the gullied area was deposited on the playground and sidewalks.

Another problem was apparent—that of getting grass to grow on the new area. The new building had been completed just in time for school to open in the fall and everyone had been more than busy and



The Mothers Club complained about the muddy shoes of the school children.

concerned with its operation. Since it was late in the year the officials had delayed the seeding work until school was dismissed for the summer.

Emery Culler, a school board member and conservation farmer, explained to the other school board members how he had received help from the local soil conservation district to develop a complete soil and water conservation plan for his



Gullies were forming on the unprotected slopes of the school grounds.

Note:—The author is work unit conservationist, Soil Conservation Service, Mansfield, Ohio.





Grounds around the Lucas School after grading and regrassing project was completed.

farm. Following his explanation the school board decided to apply to the district for help with their water disposal and seeding problems.

District supervisors were quick to approve the Lucas School Board's request for a conservation plan. Bill Wareham, chairman of the district supervisors, contacted the school board and suggested that Soil Conservation Service technicians should attend the next school board meeting and decide with them what steps should be taken.

After meeting with the school board and deciding on a plan of action, a topographic survey of the school grounds was made to determine elevations and watershed areas. The SCS technicians then designed a tailormade erosion control plan.

This involved redesigning the terraces on the slopes, which had almost silted full, and repairing the clogged tiles. In order to reduce the amount of silt being deposited on the blacktop parking areas, broad shallow water channels were planned to move the water safely around these areas. The construc-

tion work was done by a local contractor.

The whole area was seeded as soon as possible to protect the construction work from erosion and siltation damage. Since the recommendations for seeding a school ground are somewhat different from the recommendations SCS workers give to farmers for meadow and pasture seedings, they consulted with the SCS agronomist.

He recommended a 2-inch layer of topsoil on the areas that were not too steep, and heavy fertilization. A seeding of Kentucky 31 fescuegrass was then made and mulched with straw. The straw was tied down with twine to prevent it from blowing and washing off.

In order to get the seeding and mulching done as soon as possible, the school board hired 6 men to rake and seed the banks. The janitor, the coach, and the superintendent seeded and mulched the rest of the area.

Now, a year later, looking at the children playing on the lush green playgrounds and clean concrete walks, it is easy to see that the soil-washing problem on the Lucas

school grounds has been solved.

"Our conservation work cost the school around \$4,500," Barger said, "but it was worth every penny of it. Our janitor now has no trouble keeping the halls and classrooms clean. Parents no longer complain of muddy shoes and boots. The Mothers Club is helping to landscape the school grounds with trees and shrubs, and I think we are going to have one of the nicest looking schools of this size in the State."



A coastal bermudagrass spillway on a five-year-old irrigation pond "showed its stuff" last August during a heavy rain near Gilbert, S. C. Julian H. Keisler, a cooperator with the Lexington Soil Conservation District, told about the effects of the rain a few days later: "When this pond was constructed I wondered why the spillway should be 35 feet wide. On Sunday afternoon I found out. The water flowed one foot deep in the spillway and washed out the county road below the dam. But the coastal bermudagrass I planted in the bottom of the spillway did not wash out. Some of my neighbors were wishing for spillways similar to mine last Sunday afternoon when it rained so hard."

# Less Water and Less Labor

By Leon Kimberlin

**"I**'VE just finished irrigating 120 acres in 18 hours, and the job used to take 50 hours," Reuben R. (Gus) Gustafson, a co-operator of the Yuma Soil Conservation District, proudly cited.

Gustafson was irrigating on the 160-acre farm which he operates and manages for Hall Farms on the Yuma Mesa in southwestern Arizona. New concrete-lined ditches glistened in the morning sunlight, bringing life-giving water to seedling alfalfa in newly-leveled fields. In the background, land leveling equipment was putting the finishing touches on the north-east 40 acres. The irrigation system was new from one end to the other. The last field soon would

be seeded to alfalfa.

When Gustafson, formerly of Nebraska, took over the operation of the farm in September 1959, he realized that he faced some challenging problems in farming the sandy soils of the Yuma Mesa. Gustafson had learned about soil conservation districts in Nebraska. He inquired about the district at Yuma and applied for assistance in developing a soil and water conservation plan for his farm.

From Soil Conservation Service technicians he learned some interesting facts about his soil resources. He learned that his soil has a low water-holding capacity and must be irrigated frequently to maintain a water supply for growing plants. It was pointed out that if too much water is applied, the excess water



Gustafson and SCS technician discuss merits of modern concrete-lined irrigation ditches.

Note:—The author is soil conservationist, Soil Conservation Service, Yuma, Ariz.



Gustafson opens a turnout from a concrete-lined ditch that delivers a full head of water to one of his border plots.

will move rapidly through the soil to areas below the root zone, taking with it valuable plant nutrients. He found that his major problems of soil management were water application, maintenance of soil organic matter and fertility, and wind erosion control. Gustafson decided to begin with the irrigation system.

SCS technicians assisting the district made engineering surveys and designed the new system. Fields were re-leveled for more uniform distribution of water. All dirt ditches were lined with concrete to reduce seepage losses in bringing water to the fields.

When the job was completed, 160 acres had been re-leveled and 7,260 feet of new concrete ditches had been constructed.



# The Right Tools At the Right Time

By J. Alton Daniel



Gustafson uses a soil auger to estimate soil moisture needs.

When Gustafson began using the new system, he found he could apply water to his fields in predetermined amounts by regulating the time the turnouts were opened for each border. Soil moisture needs are determined with the aid of a soil auger so that excess application of water can be held to a minimum. Past records of water use compared with his present figures indicate the new system will save 900 hours of labor each year and reduce by half the total amount of water used. This represents a saving of approximately \$10 an acre per year.

In addition to the irrigation system, Gustafson's soil and water conservation plan includes crop rotations, crop residue management, cover crops, and other management practices which he has selected to best accomplish his objectives of soil maintenance and improvement. He believes in a well-rounded operation, but he is quick to point out the progress possible in water management.

**"F**OR want of a nail . . . a Kingdom was lost," so a famous quotation goes. And you could also say, "For want of the right tools at the right time . . . a conservation job was lost."

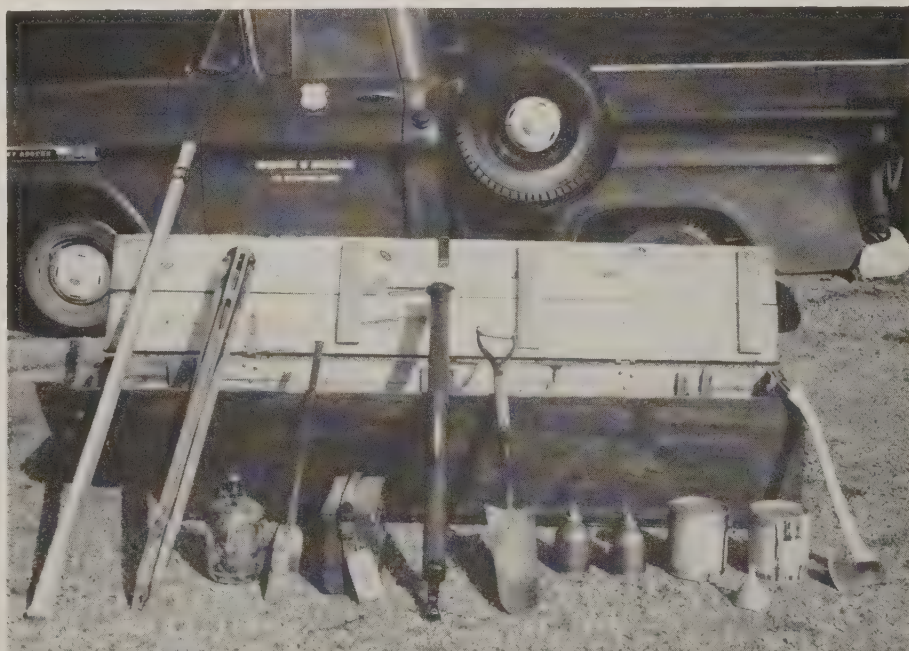
For example, an SCS technician may go to the field to survey a stock pond, but end the day showing a farmer how to use a tree injector for timber stand improvement. That is, he *could* show the farmer how to use a tree injector if he happened to take one along on that trip.

Such incidents can and often do occur. In most cases, tools are left behind because they are forgotten

or for lack of a proper place to carry them. Equipment can become "shopworn" from bouncing around in the bed of a pickup. Tools and instruments often are damaged more from rough riding in pickups than from actual use. Also, there is the endless chore for the technician to load and unload these items each morning and evening. And there is his never-ending worry about the equipment's suffering from the weather or being stolen. It is no wonder, then, that a full set of conservation tools is not taken to the field every day.

To avoid any chance of technicians going to the field without proper equipment, the Soil Conservation Service in Arkansas started

Note:—The author is area conservationist, Soil Conservation Service, Nashville, Ark.



A remodeled rocket-shipping case with the tools usually carried in it by SCS technicians in Arkansas.

looking for a solution. This was simple—equip the technicians' pickups with tool boxes. But tool boxes don't come cheap—a good wooden box costs \$40 to \$50, a metal box \$50 to \$90. For either, the cost for the State could run into a fancy figure.

The U.S. Navy came to the rescue. At the Camden, Ark., Ammunition Depot the Navy was ready to dispose of several hundred wooden rocket-shipping cases. These sturdy cases had been fabricated with metal connectors, which prevented their being scrapped for lumber. As a result, their only reuse appeared to be as storage boxes or firewood. The commanding officer of the Ammunition Depot agreed that the rocket cases could possibly be used as tool boxes. He also stated that he couldn't think of a better use for the cases than furthering soil and water conservation.

The Soil Conservation Service obtained one box to prepare a sample. The top lid was covered with metal sheeting to make the box waterproof; two strap hinges were added to make a swinging lid; a hasp was attached so that the box could be locked. Since the case was several inches longer than a pickup bed, the bottom two-thirds of the box was shortened sufficiently to fit inside the pickup. By extending the top one-third over the pickup tailgate, that portion of the box was long enough to hold an engineering rod.

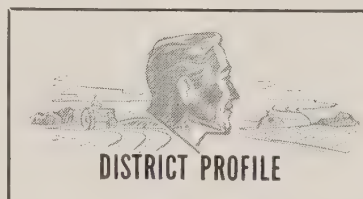
Here are some of the items one of the tool boxes can carry: an engineering rod, a level instrument with tripod, an axe, a tree injector with a can of mix containing oil and 2,4,5-T for demonstrating timber stand improvement, a soil auger and soil testing equipment, an increment borer for determining tree growth, visual aid material

illustrating the various conservation practices, a woodland information stick, and other similar conservation tools and equipment.

The cost of converting each rocket case to a tool box was about \$8. Compared to a possible cost of \$40 to \$50 each for new wooden tool boxes, a considerable saving was made by the conversion. Multiply the saving on one box by the number needed in the State and

several thousand dollars were saved. The conversion of rocket cases to tool boxes was literally an act of conservation.

Arkansas technicians now can take off any morning with no worries about the type of conservation jobs they may encounter. They can leave the tools in the box under lock and key in any type of weather. With the right tools at hand, many conservation jobs get done.



**J**AMES B. KELLY of Socorro, New Mexico, better known as "J. B." to his friends who include most of the people of Socorro County, is actively interested in nearly everything pertaining to farming and ranching in the county.

Having been born and raised in Socorro County on a ranch, it was natural for "J. B." to stay in the agricultural field. So after graduating with a degree in Agriculture from New Mexico State University in 1948, he came back to Socorro County, and on a shoe-string purchased a 152-acre farm where he raises cotton, alfalfa, and feed, and operates a livestock feeding enterprise.

Although plenty busy with his own farming and ranching operations, J. B. finds time to take part in most agricultural affairs of the county. He is a supervisor of the Socorro Soil Conservation District, executive secretary of the Socorro Livestock and Farm Bureau, serves as supervisor of the bracero hiring program in the county, and is on the County Rodeo and Fair Committee.

## *A Lot of Common Sense*

His active interest in agriculture has won him many awards. Among them are awards for being an outstanding conservation farmer, twice an outstanding District supervisor, a Bankers Award, and many others. His latest honors were to be chosen as the Outstanding Young Farmer-Businessman of 1959 for the State of New Mexico and one of the four Outstanding Young Farmers of the Nation by the Junior Chambers of Commerce.



**James B. Kelly**



CHANGE OF ADDRESS SHOULD INCLUDE ZONE, OLD ADDRESS, AND CODE NUMBER

Soil and water conservation has been one of his main interests ever since he started farming and ranching. He has served as a supervisor of the Socorro Soil Conservation District since 1957 and has been a member of conservation committees, both local and Statewide, numerous times.

In addition to his farm, J. B. has acquired an 18,950-acre ranch adjacent to the farm, and both places have complete conservation plans on which over 90 percent of the planned work has been applied.

J. B. started his conservation work by first throwing a lot of small fields together into groups having similar soil types. Then he launched into a heavy land-leveling program assisted by SCS technicians who worked out leveling plans, designed the irrigation system, and recommended cropping systems to best fit the soils.

The heavy "adobe" soils, which are common along the Rio Grande River Valley of Central New Mexico, are J. B.'s dilemma. He has tried everything to improve the soil structure, from hauling tons and tons of cotton gin trash and spreading it on the fields, to using waste perlite (treated volcanic glass, used as a lightweight aggregate). Now he is considering deep-plowing or sub-soiling to improve his irrigation efficiency.

In a few short years all his fields have been leveled, complete irri-

gation systems installed, livestock ponds constructed, wells drilled, irrigation reservoirs put in, crop rotations and crop residue uses planned and followed, along with grass management and erosion control work.

J. B. knows most of the textbook answers but does not consider himself a textbook farmer. He says, "I mix a little theory with practicality, add some good advice, and a lot of common sense, and it pays off."

—JAMES E. REEVES

### **New Variety of Russian Wildrye**

A new variety of Russian wildrye is "one of the best grasses we have for dryland conditions," says A. D. Dotzenko, associate agronomist at Colorado State University.

"It can survive long periods of drought without appreciable loss in stand, has a fairly high protein content at most stages of growth, and stays green through a greater part of the summer," Dotzenko said. "In addition, it resists lodging and produces larger seeds than commercial wildrye. This is important in establishing plantings because larger seeds produce stronger seedlings."

The Vinall variety, a selection from commercial wildrye, was developed by ARS scientists at the Northern Great Plains Field Station at Mandan, N. Dak. It is the first named variety of Russian wildrye in the United States.

Under Colorado conditions, its seed production is somewhat er-

atic, but still superior to that of commercial wildrye. All tests indicate seed quality and forage production have not been sacrificed in selecting the new variety for high seed yield.

### **High-Yielding Corn Can Aid Soil Conservation**

Efficient corn-growing methods that produce high yields per acre can be an important soil conservation measure, reports Delno Knudsen, Extension agronomist at the University of Nebraska.

"If a farmer needs 2,000 bushels of corn to feed his livestock, he will do a better job of soil conservation by growing 20 acres of corn yielding 100 bushels per acre, than by growing 40 acres averaging only 50 bushels per acre," Knudsen points out.

"By concentrating his corn growing on 20 top-producing acres, the farmer can put the remaining 20 acres into erosion-resistant crops such as grasses and legumes."

Food prices averaged about 2 percent higher in January 1960 than in January 1952, as compared with an average increase of about 15 percent in other cost-of-living items over the same period.

"Never in history have so many been fed so well by so few. The productivity of our agriculture is largely responsible for the emergence of the United States as the strongest, wealthiest, and foremost nation in the world today."

—EZRA TAFT BENSON  
*Secretary of Agriculture*

1875

















